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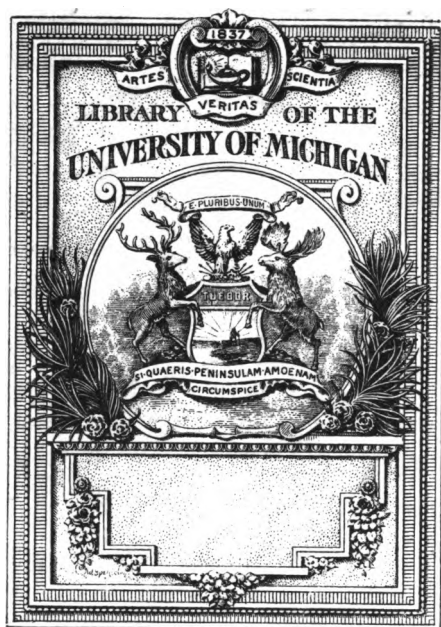
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TRANSACTIONS AND PROCEEDINGS
OF THE
BOTANICAL SOCIETY OF EDINBURGH.

VOLUME XX.

PART I.

Day - Influence of light &c
R 185-213



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TRANSACTIONS AND PROCEEDINGS
OF THE
BOTANICAL SOCIETY OF EDINBURGH.

SESSION LVIII.

See p. 185-213

MEETING OF THE SOCIETY,

Thursday, November 9, 1893.

Dr. DAVID CHRISTISON, President, in the Chair.

The following Officers of the Society were elected for the Session 1893-94:—

PRESIDENT.

Professor F. O. BOWER, D.Sc., F.R.SS. L. & E., F.L.S.

VICE-PRESIDENTS.

WILLIAM CRAIG, M.D., F.R.S.E., F.R.C.S.E.	Rev. DAVID PAUL, M.A. MALCOLM DUNN.
WILLIAM SANDERSON.	

COUNCILLORS.

Colonel FRED. BAILEY, R.E.	ROBERT ROBERTSON, M.A., B.Sc.
PATRICK NEILL FRASER, F.R.S.E.	Edin.
SYMINGTON GRIEVE.	ANDREW SEMPLE, M.B., F.R.C.S.E.
HENRY HALCRO JOHNSTON, M.B., C.M.	T. BOND SPRAGUE, M.A., F.R.S.E.
ROBERT LINDSAY.	ROBERT TURNBULL, B.Sc.
	JOHN H. WILSON, D.Sc., F.R.S.E.

TRANS. BOT. SOC. EDIN. VOL. XX.

A

Issued November 1894.

- Honorary Secretary*—Professor Sir DOUGLAS MACLAGAN, M.D., LL.D.,
P.R.S.E.
Honorary Curator—The PROFESSOR OF BOTANY.
Foreign Secretary—ANDREW P. AITKEN, M.A., D.Sc., F.R.S.E.
Treasurer—RICHARD BROWN, C.A.
Assistant Secretary—JAMES ADAM TERRAS, B.Sc.
Artist—FRANCIS M. CAIRD, M.B., C.M.
Auditor—ROBERT C. MILLAR, C.A.

LOCAL SECRETARIES.

- Aberdeen*—A. STEPHEN WILSON of North Kinmundy.
" Professor J. W. H. TRAIL, M.A., M.D., F.L.S.
Beckenham, Kent—A. D. WEBSTER.
Berwick—FRANCIS M. NORMAN, R.N.
Birmingham—GEORGE A. PANTON, F.R.S.E., 73 Westfield Road.
" W. H. WILKINSON, F.L.S., F.R.M.S., Manor Hill, Sutton
Coldfield.
Bridge of Allan—ALEXANDER PATERSON, M.D.
Calcutta—GEORGE KING, M.D., F.R.S., Botanic Garden.
" DAVID PRAIN, M.D., F.R.S.E., F.L.S., Botanic Garden.
Cambridge—CHARLES C. BABINGTON, M.A., F.R.S., Professor of Botany.
" ARTHUR EVANS, M.A.
Chirnside—CHARLES STUART, M.D.
Croydon—A. BENNETT, F.L.S.
Glasgow—Professor F. O. BOWER, D.Sc., F.R.S., F.L.S.
Kelso—Rev. DAVID PAUL, M.A., Roxburgh Manse.
" Rev. GEORGE GUNN, M.A., Stichel Manse.
Kilbarchan—Rev. G. ALISON.
Lincoln—GEORGE MAY LOWE, M.D., C.M.
London—WILLIAM CARRUTHERS, F.R.S., F.L.S., British Museum.
" JOHN ARCHIBALD, M.D., F.R.S.E.
Melbourne, Australia—Baron FERDINAND VON MUELLER, M.D.,
K.C.M.G., F.R.S.
Nova Scotia—Professor GEORGE LAWSON, LL.D., Dalhousie.
Ottawa, Ontario—W. R. RIDDELL, B.Sc., B.A., Prov. Normal School.
Perth—F. BUCHANAN WHITE, M.D., F.L.S.
Saharunpore, India—J. F. DUTHIE, B.A., F.L.S.
Sevenoaks—E. M. HOLMES, F.L.S.
Silloth—JOHN LEITCH, M.B., C.M.
St. Andrews—Professor M'INTOSH, M.D., LL.D., F.R.S.S. L. & E.
Wellington, New Zealand—Sir JAMES HECTOR, M.D., K.C.M.G.,
F.R.S.S. L. & E.
Wolverhampton—JOHN FRASER, M.A., M.D.

JOHN GRIEVE, M.D., F.R.S.E., was elected Resident Fellow of the Society.

The President made intimation of the death of ROBERT HARVIE, and of CHARLES JENNER, Resident Fellows of the Society, and of W. ETHERINGTON DIXON, Associate.

Presents to the Library at the Royal Botanic Garden were announced. Amongst them being a copy of the first fasciculus of the new "Index Kewensis."

Professor BAYLEY BALFOUR informed the Society that Mr. GEORGE WILLIAM TRAILL, the well-known algologist, had presented his magnificent collection of algæ to the Society.

Mr. MALCOLM DUNN exhibited a number of cut blooms of herbaceous and other plants from the open ground, to show the mildness of the season and the occurrence of late and second blooms, amongst them being:—An apple (Liberton Ringer), several kinds of rose, stock, rosemary, anemone, strawberry tree, primrose, etc.; also twigs of *Chimonanthus fragrans*, with flower buds, and a few clusters of strawberries.

Professor BAYLEY BALFOUR exhibited specimens, sent by Dr. Aitchison from Gulmey, Kashmir, preserved in spirit, of *Arceuthobium minutissimum*, Hook. fil., on *Pinus excelsa*, a loranthaceous plant described by Sir Joseph Hooker in the Flora of British India V., 227, and referred to by him as "the most minute dicotyledonous plant I can call to mind"; also specimens of proliferous *Reseda alba* received from C. A. Middleton, Esq., Manxhead, Stow.

Mr. CAMPBELL sent for exhibition, from the open ground of his garden at Ledaig, Argyllshire, cut blooms of *Veronica Andersoni* and var., *Escallonia macrantha*, and other half-hardy plants.

The following Papers were read:—

EXCURSION OF THE SCOTTISH ALPINE BOTANICAL CLUB TO CLOVA, 1893. By Rev. DAVID PAUL, M.A., Roxburgh.

This year the visit of the Scottish Alpine Botanical Club was to the classic ground of Clova. The party which

assembled in the Ogilvie Arms Hotel on the 10th of July consisted of Mr. W. B. Boyd of Faldonside, president; Rev. George Alison, Kilbarchan, chaplain; Rev. George Gunn, Stichel; Commander Norman, R.N., Berwick; Dr. Stuart of Chirnside; Dr. Church of Edinburgh; Mr. Potts, and myself. A business meeting was held in the evening, at which Mr. Gunn was elected a member of the Club, and a sum of five guineas was voted to the Illustration Fund of the Botanical Society.

Leave having been obtained from the proprietor of Clova and from the shooting-tenant to visit both Glen Dole and Glen Fee, we arranged to confine ourselves next day (Tuesday) to the north side of the latter glen. Fortunately the day was dry, and bright and warm. We met the keeper of the deer forest at Glen Dole Lodge, who gave us every facility to pursue our investigations, but our finds were not very numerous. As we walked up the glen on the low ground, *Trientalis europæa*, L., was plentiful, and *Arctostaphylus Uva-Ursi*, Spreng., was found. Ascending to the rocks on the right, and working round the base of them, we reached the well-known station of the *Oxytropis campestris*, D. C., the only locality where it has been found in Britain. It covers the rock over a considerable area. Many of the plants were very large and fine, and there seems to be no danger of its being exterminated.* Associated with this rare plant on the same rocks the rare moss, *Trichostomum glaucescens*, Hedw., occurs, which, after a good deal of searching, Mr. Boyd found two small morsels of, but not in fruit. The present confusion in the nomenclature of the mosses is well illustrated by this species. Of the eight names that have been given to it, seven have been employed by British bryologists. In 1792, Hedwig named it *Trichostomum glaucescens*, and he was followed by Wilson, and by Hobkirk in the first edition of his Synopsis. In 1801, Dickson called it *Bryum glaucescens*. In 1807, Weber and Mohr gave it the name of *Didymodon glaucescens*, and they were followed by Greville and Hooker. The last author also styles it *Didymodon*

* It is worth noting that in Germany this plant, under the name of *Oxytropis pilosa*, is widely distributed on rocky declivities, while the other species of the same genus, under the name of *O. montana*, occurs only in Bavaria on stony hill-meadows, the rarer species here being the commoner there.

æruginosus. Hobkirk, in his second edition, uses the name *Ditrichum glaucescens*. In Berkeley's Handbook it is found as *Leptotrichum glaucescens*. Finally, Braithwaite calls it *Saelania cæsia*, following Lindberg, and remarks, curiously enough, in the face of all this variety of nomenclature, that "it is a good example of a truly natural genus." It is to be hoped that, after the completion of Dr. Braithwaite's valuable Moss-Flora, a greater degree of order will be introduced into this baffling confusion.

As we proceeded along the base of the rocks, nothing of special importance was found, so Mr. Gunn and I climbed up the face of the cliffs out on to the table-land above in search of *Carex rariflora*, Sm., which, however, we did not light upon. In the midst of a very large bed of *Scirpus cæspitosus*, Linn., occurred a patch of considerable size, which presented a remarkable appearance. On the summit of every stem, in place of the usual flower head, was what had the appearance of a small delicate egg-shaped fruit, like a miniature plum, of a bluish-brown colour, very smooth and regular in shape, and conspicuous enough to be observable some yards off. I gathered specimens, and submitted them to Professor Trail of Aberdeen, who was of opinion that the fungus was probably *Ustilago caricis*, and stated that he had not before met with an *Ustilago* on that plant. Rejoining the members of the party we had left below, who had found a certain number of the Alpine plants that were to be expected in that locality, we at length brought a delightful day to an end.

The chief plants found were these:—*Draba incana*, Linn.; *Silene acaulis*, Linn.; *Oxytropis campestris*, D.C.; *Saxifraga oppositifolia*, Linn.; *S. nivalis*, Linn.; *S. stellaris*, Linn.; *S. aizoides*, Linn.; *Saussurea alpina*, D.C.; *Arctostaphylos Uva-Ursi*, Spreng.; *Trientalis europæa*, Linn.; *Salix myrsinites*, Linn.; *Carex capillaris*, Linn., etc.; *Cryptogramme crispa*, R. Br.; *Asplenium viride*, Huds.; *A. trichomanes*, Linn.; *Polystichum aculeatum*, Syme; *P. var. lobatum*, Presl.; *P. lonchitis*, Roth.; *Lastræa oreopteris*, Presl.; *Lycopodium Selago*, Linn.; *L. annotinum*, Linn.; *L. alpinum*, Linn.; *Selaginella selaginoides*, Gray.

Wednesday, 12th July, did not promise well, being cloudy and foggy. We drove up to Acharn, and found

that Fraser, the forester, had received a letter; which limited our visit to two days. This obliged us to alter our plans. We had intended to visit that day the south side of Glen Fee in one party, and the next day to go up Glen Dole. We now arranged that Messrs. Alison, Stuart, and Norman should, with the forester, proceed by Glen Dole to the station of the *Lychnis alpina*, Linn., on Little Gilrannock, while the rest of us should examine the corrie on the south side of Glen Fee for *Carex alpina*, Sw., and *Carex Grahami*, Boott. Unfortunately, before we reached the corrie, it came on to rain, and it continued to rain most of the day, making things very uncomfortable for us, as the wind also was cold, and thick mist drifted over the rocks. *Carex Grahami* was found in one spot in a wet, level place, some distance up the rocks, but not very much of it, and it is desirable that when it is found again it should be treated tenderly, as it might easily be extirpated. We got some good specimens, but spared the roots. It grows a foot or 18 inches high, and is not unlike a large *C. pulla*, only not so dark in colour. We gathered also *Carex vaginata*, Tausch; *Carex atrata*, Linn.; and very handsome specimens of *Carex rigida*, Good. We searched long, but unsuccessfully, for *Carex alpina*. If the day had not been so wretchedly bad, we should probably have found it, as it seems to grow on more than one spot; but, as I now understand, we were most of the time hunting on the wrong ground. We meant to go out at the top of the corrie and round by the head of the glen to the other side of the Fee Burn, to examine the upper rocks there for *Woodsia*, and then to meet the other party in Glen Dole; but we had spent so much time in the corrie, and were so wet, that that part of the programme had to be given up. The only other plants we found worth mentioning were *Veronica alpina*, Linn., *Epilobium alsinefolium*, Vill., and *E. alpinum*, Linn. One or two plants of *Tetraplodon mnioides*, B. and S., were also found. On returning to Acharn, we met the rest of our company, who reported that there was still a considerable quantity of *Lychnis alpina* in its old station.

On Thursday, 13th July, we walked up to Loch Brandy, where one of the party fished with more zeal than success,

and where a few things were found, such as *Loiseleuria procumbens*, Desv., *Lobelia Dortmanna*, Linn., and *Isoetes lacustris*, Linn. Abundance of *Meum Athamanticum*, Jacq., was growing near the hotel.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING JULY, AUGUST, SEPTEMBER, AND OCTOBER. By ROBERT LINDSAY, Curator.

JULY.

The month of July was, on the whole, favourable. Rain fell on 18 days during the month. This was much needed after the long spell of fine dry weather during preceding months. The lowest night temperature was 42°, which occurred on the 6th of the month, and the highest 55°, on the 10th. The lowest day temperature was 61°, on the 4th, and the highest 76°, on the 23rd.

The common lime-tree was laden with blossom more abundantly than usual during the month, and the New Zealand shrub, *Olearia Haastii*, was completely covered with masses of sweet-scented white flowers, both of which were highly attractive to bees.

On the rock-garden 112 species and well-marked varieties came into flower, as against 237 for the corresponding month last year. A few of the best flowered were:—*Anemone rivularis*, *Anemonopsis macrophylla*, *Aubrietia macrostyla*, *Aster Thomsonii*, *Alyssum argenteum*, *Campanula macrantha alba*, *C. isophylla alba*, *Cistus formosus*, *Cineraria geifolia*, *Coronilla iberica*, *Chrysanthemum maximum*, *Dianthus Atkinsoni*, *Fuchsia Riccartoni*, *Gentiana asclepiadea alba*, *Helichrysum anatolicum*, *Hypericum coris*, *Lilium canadense flavum*, *Micromeria piperella*, *Monarda Kalmiana*, *Meconopsis Wallichii*, *Oenothera Sellowi*, *Potentilla verna fl. pl.*, *Rosa viridiflora*, *Scrophularia sambucifolia*, *Rhododendron anthopogon*.

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	46°	54°	65°	17th	49°	63°	70°
2nd	51	60	72	18th	49	62	75
3rd	53	57	64	19th	49	63	75
4th	50	54	61	20th	45	64	68
5th	49	54	66	21st	43	63	71
6th	42	61	67	22nd	46	60	70
7th	55	66	70	23rd	49	64	76
8th	52	64	67	24th	49	54	73
9th	53	65	70	25th	47	51	69
10th	55	61	71	26th	50	61	71
11th	49	58	67	27th	42	60	70
12th	52	53	67	28th	42	55	72
13th	47	54	62	29th	50	60	71
14th	47	57	71	30th	45	53	70
15th	48	58	70	31st	46	61	69
16th	46	61	73				

AUGUST.

August was an exceedingly warm month, there was an entire absence of anything like cold weather throughout. Rain and thunderstorms were rather frequent, but the month, on the whole, was a most favourable one. The lowest night temperature was 38°, which occurred on the 28th of the month, and the highest 58°, on the 16th. The lowest day temperature was 63°, on the 31st of the month, and the highest 87°, on the 15th and 16th.

On the rock-garden 73 species and varieties of hardy plants came into flower, as against 103 during the previous August. Amongst the most interesting were:—*Allium glaucum*, *Campanula floribunda*, *Centaurea alpina*, *Colchicum speciosum*, *Coreopsis verticillata*, *Carlina subcaulescens*, *Cyclamen europæum*, *Erica Lawsoniana*, *E. Watsoni*, *Delphinium sulphureum*, *Gladiolus Saundersii*, *Hypericum Elæoides*, *H. patulum*, *Montbretia crocosmæflora*, *Origanum Dictamnus*, *Polygonum capitatum*, *P. vacciniifolium*, *Senecio compacta*, *Statice minuta*, *Sedum latifolium*, *Veronica longifolia sub-sessilis*, *Zauschneria californica*.

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	46°	60°	68°	17th	54°	64°	85°
2nd	50	64	72	18th	55	64	81
3rd	49	61	67	19th	51	63	73
4th	49	60	68	20th	54	60	74
5th	46	50	66	21st	52	59	65
6th	45	57	67	22nd	51	61	69
7th	41	56	67	23rd	48	60	71
8th	42	61	78	24th	50	61	69
9th	54	64	80	25th	47	65	70
10th	52	59	74	26th	48	61	69
11th	54	61	73	27th	43	54	65
12th	53	68	75	28th	38	56	64
13th	48	65	76	29th	48	60	72
14th	55	64	81	30th	47	60	71
15th	55	73	87	31st	54	56	63
16th	58	65	87				

SEPTEMBER.

The month of September was cool and unsettled, with heavy falls of rain. The first frost this season took place on the 11th of the month, when the thermometer registered 32°, which was repeated on the 23rd. The lowest day temperature was 50°, on the 23rd, and the highest 72°, on the 2nd of the month.

Most herbaceous plants flowered very well during the month; strawberries and *Gentiana acaulis* were observed in flower for the second time during this month, as were also laburnums and rhododendrons. Autumn tints began to show early in the month, and were most effective on *Pavia flava*, lime-tree, horse-chestnut, and Ghent azaleas.

On the rock-garden a large number of plants were in flower, but only 28 came into flower in September, as against 45 for the corresponding month last year, a few of the most interesting being:—*Adlumia cirrhosa*, *Aster Stracheyi*, *Colchicum maximum*, *Crocus annulatus*, *C. medius*, *C. Salzmanni*, *Dianthus Seguierii*, *Erica Mackiana*, *E. Stuartii*, *Fuchsia sanguinea*, *Gratiola officinalis*, *Potentilla Mooniana*, *Polygonum capitatum*, *Teucrium flavum*, *Thymus striatus*, *Kniphofia nobilis*, *K. Saundersii*, *Sedum Fabaria*, *S. spectabilis*.

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	48°	54°	66°	16th	43°	59°	64°
2nd	54	64	72	17th	44	56	69
3rd	53	58	63	18th	49	55	65
4th	46	60	72	19th	50	55	64
5th	48	61	70	20th	39	54	62
6th	50	58	68	21st	36	40	59
7th	51	58	68	22nd	37	46	57
8th	49	53	63	23rd	32	39	50
9th	40	46	63	24th	34	49	53
10th	34	49	58	25th	33	46	57
11th	32	35	61	26th	41	45	50
12th	33	36	67	27th	43	48	53
13th	45	60	64	28th	43	49	66
14th	53	61	72	29th	43	48	62
15th	54	60	64	30th	43	53	61

OCTOBER.

The month of October was somewhat mild and changeable, but was a favourable month on the whole. The thermometer was at or below the freezing-point on five occasions, indicating collectively 18° of frost for the month, as against 44° for the corresponding month of last year. The lowest readings were—on the 4th, 30°; 5th, 30°; 9th, 32°; 30th, 27°; 31st, 23°. The lowest day temperature was 50°, on the 26th, and the highest 67°, on the 1st. Autumn tints were very fine this season, though of short duration. The beautiful and varied foliage colouring was most effective on scarlet and Hungarian oaks, various species of *Acer* and *Pyrus*, *Cornus*, *Liriodendron*, *Liquidamber*, *Azalea*, *Ampelopsis*, and *Berberis*. The brown tints on *Biotas* and other conifers are very pronounced this season, and very interesting. Hardy rhododendrons and azaleas are well set with flower-buds for next season. Fruit is plentiful on most trees and shrubs; hollies are rather poorly set with berries; and *Pyrus latifolia*, large trees of which in the garden never have failed, that I remember, to produce great quantities of fruit—the delight of numerous birds that abound in the garden—this year is a notable exception, being almost barren of fruit; probably the very dry weather which prevailed during their flowering

period has prevented the berries from setting. Herbaceous plants and annuals continued to flower freely until the end of the month.

On the rock-garden only 3 plants came into flower during the month, viz.:—*Aconitum californicum*, *Helleborus niger grandiflora*, and *Gynerium argenteum*. A good many plants have flowered a second time, among which were:—*Rhododendron ferrugineum*, *Ulex europæus*, and *Pyrus japonica*.

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	45°	55°	67°	17th	45°	49°	63°
2nd	37	55	65	18th	37	48	55
3rd	39	52	60	19th	47	53	62
4th	30	40	57	20th	45	51	63
5th	30	51	57	21st	51	57	63
6th	37	52	60	22nd	37	48	62
7th	40	50	59	23rd	39	49	55
8th	43	48	58	24th	45	55	59
9th	32	45	54	25th	45	55	57
10th	36	49	55	26th	34	39	50
11th	38	50	57	27th	34	44	54
12th	37	49	56	28th	39	52	55
13th	36	44	57	29th	37	39	53
14th	42	54	67	30th	27	33	45
15th	53	59	66	31st	23	32	46
16th	52	58	62				

II. (1) METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF JULY 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direction.	
		Max.	Min.	Dry.	Wet.					
1	30-062	68-8	51-2	58-9	53-2	E.	St.	10	E.	0-000
2	30-032	62-3	53-3	57-0	55-8	E.	St.	10	E.	0-075
3	30-112	71-4	56-1	57-7	56-7	E.	St.	10	E.	0-010
4	30-075	59-2	53-1	55-1	53-1	E.	Cum.	10	E.	0-000
5	29-995	57-0	51-9	53-7	51-7	E.	Cum.	10	E.	0-000
6	30-020	59-0	50-9	58-2	54-1	E.	Cum.	1	E.	0-000
7	29-851	62-0	53-9	61-8	57-9	E.	...	0	...	0-000
8	29-700	68-8	53-9	56-1	53-3	E.	Cum.	10	E.	0-535
9	29-413	64-1	55-5	64-4	61-6	S.E.	Cum.	2	S.E.	0-200
10	29-678	68-0	55-8	60-3	57-3	S.E.	Cum.	10	S.E.	0-480
11	29-700	64-8	55-3	58-7	57-3	S.E.	Cum.	10	S.E.	0-070
12	29-659	60-8	55-0	56-7	55-1	N.E.	Nim.	10	N.E.	0-200
13	29-653	56-6	50-9	53-7	50-3	N.E.	Cum.	10	N.E.	0-000
14	29-804	57-7	49-9	55-1	50-9	N.	Cum.	9	N.	0-000
15	29-867	61-8	51-9	56-5	51-1	N.E.	Cum.	10	W.	0-000
16	29-744	62-8	46-8	60-7	56-9	W.	Cum.	9	S.W.	0-230
17	29-611	66-7	49-1	63-3	56-2	N.W.	Cum.	6	N.W.	0-001
18	29-826	65-8	52-1	61-9	56-3	N.W.	Cir.	2	N.W.	0-210
19	29-347	67-8	53-0	63-9	60-9	W.	Cum.	6	W.	0-001
20	29-248	71-2	54-3	60-1	55-1	W.	Cum.	9	W.	0-000
21	29-457	66-6	49-0	50-8	55-1	W.	Cum.	2	W.	0-000
22	29-684	67-8	50-1	61-8	55-1	W.	Cum.	6	W.	0-000
23	29-924	68-4	43-8	59-8	52-9	W.	...	0	...	0-010
24	29-624	66-5	58-0	62-2	58-2	S.W.	Cum.	10	S.W.	0-260
25	29-472	72-0	50-9	54-0	53-2	W.	Nim.	10	W.	0-035
26	29-708	68-6	52-8	60-1	55-9	N.	Cum.	10	N.	0-001
27	30-106	63-7	46-0	59-9	52-1	N.E.	Cir.	4	N.	0-000
28	30-104	63-8	46-2	55-1	53-0	S.E.	St.	10	E.	0-010
29	29-902	64-9	52-8	58-9	56-1	W.	Cum.	10	W.	0-000
30	29-773	65-8	47-5	58-3	54-1	N.	Cum.	10	N.	0-340
31	29-787	63-5	48-3	62-5	55-8	N.	Cum.	5	N.	0-060

Barometer.—Highest Observed, on the 3rd, = 30·112 inches. Lowest Observed, on the 20th, = 29·248 inches. Difference, or Monthly Range, = 0·864 inch. Mean = 29·772 inches.

S. R. Thermometers.—Highest Observed, on the 25th, = 72°·0. Lowest Observed, on the 23rd, = 43°·8. Difference, or Monthly Range, = 28°·2. Mean of all the Highest = 64°·8. Mean of all the Lowest = 51°·6. Difference, or Mean Daily Range, = 13°·2. Mean Temperature of Month = 58°·2.

Hygrometer.—Mean of Dry Bulb = 58°·7. Mean of Wet Bulb = 55°·0.

Rainfall.—Number of Days on which Rain fell = 18. Amount of Fall = 2·728 inches. Greatest Fall in 24 hours, on the 8th, = 0·535 inch.

A. D. RICHARDSON,
Observer.

(2) METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF AUGUST 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71.5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direction.	
		Max.	Min.	Dry.	Wet.					
		°	°	°	°					
1	29.811	65.0	49.6	60.1	54.3	N.W.	Cir.	6	N.W.	0.065
2	29.675	64.3	58.0	64.3	59.2	N.W.	Cum.	5	N.W.	0.180
3	29.361	69.1	53.0	62.9	61.7	S.W.	Cum.	10	S.W.	0.155
4	29.410	66.2	49.7	64.3	58.1	S.W.	Cum.	1	S.W.	0.480
5	29.714	64.8	49.1	52.3	51.3	N.	Nim.	10	N.	0.050
6	29.967	62.7	45.1	58.0	53.0	E.	{Cir.Cum.	8	W.}	0.235
7	29.753	64.7	54.1	57.8	56.4	S.	Cum.	1	S.E.}	0.001
8	29.872	70.9	55.5	63.7	61.4	W.	St.	10	S.E.	0.001
9	29.976	71.0	53.9	63.9	61.2	N.W.	Nim.	10	S.W.	0.013
10	29.805	77.9	57.5	58.9	58.0	E.	Cum.	8	W.	0.069
11	29.801	68.7	57.3	60.4	59.3	E.	Nim.	6	E.	0.165
12	29.863	69.9	53.5	68.7	63.9	S.E.	Cum.	10	E.	0.074
13	30.065	73.5	50.5	66.9	61.3	S.W.	Cum.	5	S.W.	0.000
14	30.095	75.0	57.0	65.8	63.9	W.	Cir.	4	W.	0.000
15	30.053	75.8	58.0	75.0	68.3	W.	Cir.	2	W.	0.000
16	30.048	82.8	59.4	68.2	64.4	W.	...	0	...	0.000
17	29.883	75.0	57.1	63.9	61.9	W.	Cum.	7	W.	0.000
18	29.579	75.8	58.5	64.5	62.2	S.W.	Cum.	10	S.W.	0.000
19	29.617	77.0	54.5	69.7	62.2	S.W.	Cir.	8	S.W.	0.000
20	29.841	74.2	55.2	60.0	58.7	0	...	0.505
21	29.008	71.6	56.7	59.7	55.5	S.W.	{Cir.	2}	S.W.	0.298
22	29.358	66.1	54.3	62.6	56.5	S.W.	{Cum.	6}	S.W.	0.024
23	29.567	68.0	48.8	59.0	56.9	S.W.	Cum.	2	W.	0.267
24	29.637	67.9	49.1	59.0	55.8	S.W.	Cum.	6	S.W.	0.099
25	29.983	67.0	50.1	68.0	57.4	W.	Cum.	8	W.	0.000
26	30.011	66.6	50.0	58.8	54.9	N.W.	Cir.	4	N.W.	0.000
27	30.017	68.6	49.3	56.4	51.3	W.	Cum.	2	W.	0.000
28	30.150	63.9	40.8	56.1	52.4	N.E.	Cum.	8	N.E.	0.000
29	30.127	63.1	49.0	60.6	56.3	...	{Cir.	2}	N.E.	0.000
30	29.952	73.3	51.1	63.0	57.9	W.	{Cum.	4}	W.	0.000
31	29.791	70.7	54.0	54.7	53.8	S.W.	Cum.	8	S.W.	0.019
						N.E.	Nim.	10	N.E.	0.022

Barometer.—Highest Observed, on the 28th, = 30.150 inches. Lowest Observed, on the 21st, = 29.008 inches. Difference, or Monthly Range, = 1.142 inch. Mean = 29.784 inches.

S. R. Thermometers.—Highest Observed, on the 16th, = 82° 8. Lowest Observed, on the 28th, = 40° 8. Difference, or Monthly Range, = 42° 0. Mean of all the Highest = 70° 0. Mean of all the Lowest = 52° 9. Difference, or Mean Daily Range, = 17° 1. Mean Temperature of Month = 61° 4.

Hygrometer.—Mean of Dry Bulb = 62° 0. Mean of Wet Bulb = 58° 4.

Rainfall.—Number of Days on which Rain fell = 18. Amount of Fall = 2.671 inches. Greatest Fall in 24 hours, on the 19th, = 0.505 inch.

A. D. RICHARDSON, }
A. ANDERSON, } Observers.

(3) METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF SEPTEMBER 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direction.	
		Max.	Min.	Dry.	Wet.					
1	29-756	59-9	50-5	59-9	53-9	S. W.	Cum.	10	S. W.	0-055
2	30-007	66-0	55-6	64-1	60-0	N. W.	Cum.	10	N. W.	0-000
3	30-190	71-8	53-7	58-9	55-1	E.	Cum.	10	E.	0-000
4	30-091	63-5	48-8	63-3	58-9	N.	Cir.	1	N.	0-000
5	29-853	71-8	49-4	62-8	58-2	W.	...	0	...	0-000
6	29-633	70-2	51-4	60-1	56-9	W.	Cum.	8	W.	0-060
7	29-449	67-8	53-1	60-1	58-2	W.	Cum.	9	W.	0-080
8	29-440	68-0	50-3	59-7	55-0	W.	{ Cir. 4 } Cum. 2	4	W.	0-065
9	29-776	62-8	41-0	51-9	47-7	N.	Cum.	5	N.	0-010
10	30-014	62-9	36-2	50-2	44-9	N. W.	...	0	...	0-000
11	29-777	58-0	36-0	54-0	49-4	N.	...	0	...	0-000
12	30-204	60-9	36-5	57-2	52-1	N. W.	...	0	...	0-000
13	29-769	64-6	51-8	60-3	57-2	S. W.	Cum.	10	S. W.	0-000
14	29-959	64-0	54-9	61-0	59-1	W.	Cum.	10	W.	0-000
15	29-803	67-7	59-2	62-7	59-1	S. W.	Cum.	10	S. W.	0-000
16	29-756	63-8	50-9	57-7	54-3	W.	Cum.	1	W.	0-000
17	29-587	62-9	45-0	54-1	51-3	W.	Cum.	10	W.	0-020
18	29-356	58-8	52-4	57-1	56-0	W.	Nim.	10	W.	0-040
19	29-065	61-6	53-0	57-1	52-0	W.	Cum.	2	W.	0-045
20	29-203	61-7	41-4	49-0	45-8	W.	Cir.	4	W.	0-000
21	29-346	58-7	38-0	46-8	44-8	W.	Cir.	10	N.	0-130
22	29-490	52-0	40-0	47-3	44-1	N. W.	Cum.	9	N. W.	0-070
23	29-356	53-2	34-8	40-9	37-9	N. W.	St.	10	N. W.	0-010
24	29-806	48-3	36-1	46-8	43-8	W.	Cir. St.	9	N.	0-050
25	29-857	51-1	42-0	48-2	42-4	N. W.	Cir.	2	N. W.	0-060
26	29-793	54-0	42-0	45-5	44-2	E.	Cum.	10	E.	0-020
27	29-615	49-8	45-0	49-8	49-1	W.	Nim.	10	W.	0-090
28	29-326	55-7	44-0	55-7	51-7	W.	Cum.	9	W.	0-840
29	28-820	64-6	46-0	56-1	51-0	S. W.	Nim.	10	S. W.	0-130
30	28-943	61-8	45-2	53-2	49-0	S. W.	Cir.	2	S. W.	0-175

Barometer.—Highest Observed, on the 12th, = 30·204 inches. Lowest Observed, on the 29th, = 28·820 inches. Difference, or Monthly Range, = 1·384 inch. Mean = 29·635 inches.

S. R. Thermometers.—Highest Observed, on the 3rd and 5th, = 71°·8. Lowest Observed, on the 23rd, = 34°·8. Difference, or Monthly Range, = 37°·0. Mean of all the Highest = 61°·3. Mean of all the Lowest = 46°·1. Difference, or Mean Daily Range, = 15°·2. Mean Temperature of Month = 53°·7.

Hygrometer.—Mean of Dry Bulb = 55°·0. Mean of Wet Bulb = 51°·4.

Rainfall.—Number of Days on which Rain fell = 18. Amount of Fall = 1·950 inch. Greatest Fall in 24 hours, on the 28th, = 0·840 inch.

A. D. RICHARDSON, }
A. ANDERSON, } Observers.

(4) METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF OCTOBER 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direction.	
		Max.	Min.	Dry.	Wet.					
		°	°	°	°					
1	29·331	60·9	44·7	55·4	51·3	S.W.	Cir.	5	N.W.	0·020
2	29·381	60·9	40·9	52·3	49·8	W.	Cir. St.	4	S.	0·045
3	29·134	58·8	42·3	48·0	45·3	W.	Cir.	2	S.	0·010
4	28·917	56·8	34·8	42·2	41·6	S.W.	Cum.	10	S.W.	0·000
5	29·008	48·0	33·1	45·9	43·9	N.W.	...	0	...	0·000
6	29·202	55·6	39·9	48·5	46·8	W.	...	0	...	0·000
7	29·493	57·7	43·6	51·1	48·8	W.	...	0	...	0·950
8	29·451	57·0	42·8	50·3	50·1	N.E.	Nim.	10	N.E.	0·060
9	29·745	53·8	35·0	47·2	45·2	S.	Cum.	5	S.	0·000
10	29·539	52·4	39·9	46·4	44·8	S.W.	...	0	...	0·000
11	29·494	53·8	40·1	48·2	44·2	N.W.	...	0	...	0·000
12	29·759	56·0	41·8	46·8	43·2	W.	...	0	...	0·000
13	29·941	54·8	39·0	45·7	43·1	N.W.	Cir. St.	10	N.W.	0·365
14	29·487	56·4	45·4	56·1	55·9	W.	Nim.	10	W.	0·245
15	29·550	60·0	55·6	59·7	58·7	S.W.	Cum.	10	S.W.	0·020
16	29·528	63·4	55·6	59·0	56·1	W.	Cum.	4	W.	0·000
17	29·857	61·4	47·2	50·0	48·0	W.	...	0	...	0·000
18	30·025	58·0	39·0	48·0	46·7	N.W.	Cum.	6	N.W.	0·000
19	30·157	55·9	46·9	53·3	50·9	W.	Cum.	10	W.	0·000
20	30·107	58·5	47·9	51·4	48·8	S.W.	Cir. St.	10	S.W.	0·000
21	29·858	59·9	50·9	59·3	57·1	S.W.	Nim.	10	S.W.	0·025
22	29·981	61·8	41·6	50·1	47·2	S.W.	Cum.	2	W.	0·000
23	30·294	55·6	38·7	43·6	42·3	W.	...	0	...	0·000
24	30·027	53·8	42·9	52·0	49·5	W.	Cum.	5	W.	0·185
25	29·486	56·9	49·0	49·2	48·7	S.W.	Nim.	10	S.W.	0·700
26	29·418	49·8	36·1	40·0	38·1	W.	Cir.	5	N.	0·000
27	29·703	46·0	36·0	43·7	41·2	W.	...	0	...	0·000
28	29·337	52·8	43·1	52·8	50·1	W.	{ Cir. Cum.	2) 1}	W.	0·010
29	29·400	56·8	38·0	39·2	37·8	W.	...	0	...	0·020
30	29·821	44·9	29·1	33·1	31·5	N.W.	...	0	...	0·000
31	30·098	43·9	26·0	31·7	30·6	N.W.	...	0	...	0·055

Barometer.—Highest Observed, on the 23rd, = 30·294 inches. Lowest Observed, on the 4th, = 28·917 inches. Difference, or Monthly Range, = 1·377 inch. Mean = 29·630 inches.

S. R. Thermometers.—Highest Observed, on the 16th, = 63°·4. Lowest Observed, on the 31st, = 26°·0. Difference, or Monthly Range, = 37°·4. Mean of all the Highest = 55°·2. Mean of all the Lowest = 41°·5. Difference, or Mean Daily Range, = 13°·7. Mean Temperature of Month = 48°·3.

Hygrometer.—Mean of Dry Bulb = 48°·4. Mean of Wet Bulb = 46°·4.

Rainfall.—Number of Days on which Rain fell = 14. Amount of Fall = 2·710 inches. Greatest Fall in 24 hours, on the 7th, = 0·950 inch.

A. D. RICHARDSON,
Observer.

III. ON *RIBES SUBVESTITUM*, Hooker and Arnott. By
A. D. RICHARDSON.

In 1882 a *Ribes*, of which a dried specimen is exhibited, was received by the Edinburgh Arboretum from the Royal Gardens, Kew, under the name of *Ribes Cynobasti*.

In the end of April of the present year, when the plant was in flower, I endeavoured to ascertain whether it was correctly named, the result being that it turned out to be, not *Ribes Cynobasti*, but *R. subvestitum* of Hooker and Arnott.

On a first comparison I was led to believe that it was *R. Lobbi* of Gray, a Californian species, from the fact that a woodcut and description in the "Gardeners' Chronicle" (Vol. XIX., N. S., p. 11), of what I then understood to be that species, seemed to agree very closely in every respect with our plant, and which was stated in the accompanying letterpress to be synonymous with *R. subvestitum* of Hooker in the "Botanical Magazine" (Vol. 82, t. 4931), but not with *R. subvestitum* of Hooker and Arnott in the "Botany of Beechey's Voyage." On turning to the "Botanical Magazine," however, I was surprised to find that the plant there figured as *R. subvestitum* was said to be synonymous with *R. subvestitum* of Hooker and Arnott, but it did not quite agree with our plant, or with that figured in the "Gardeners' Chronicle."

In the belief that two species were involved in the "Botanical Magazine" and "Gardeners' Chronicle" figures, and seeing that these two works contradicted each other regarding the synonymy, I sent to the editor of the "Gardeners' Chronicle" (Dr. Masters) a specimen of our plant, and, at the same time, drew his attention to the contradictory statements before mentioned. In his reply, Dr. Masters stated that the plant from which the "Gardeners' Chronicle" figure was made was received from Kew as *R. subvestitum* of Hooker in the "Botanical Magazine"; and that that plant being the same as *R. Lobbi* of Gray, a mistake had somehow arisen in attaching the name *Lobbi* to the figure. He also stated that the "Gardeners' Chronicle" plant and our plant were one and the same species, viz., *R. Subvestitum* of Hooker and Arnott,

which species in his opinion was only a variety of *R. Menziesii* of Pursh.

The synonymy, therefore, stands thus:—

1. *R. Lobbi* of the "Gardeners' Chronicle" (not of Gray) and the Edinburgh Arboretum plant are *R. subvestitum* of Hooker and Arnott (not of the "Botanical Magazine.")
2. *R. Lobbi* of Gray (not of the "Gardeners' Chronicle") is the same as *R. subvestitum* of Hooker in the "Botanical Magazine" (not of Hooker and Arnott.)

R. subvestitum of Hooker is a native of California, and was first discovered by the naturalists of Captain Beechey's surveying voyage. It was subsequently introduced into this country by Lobb, and it therefore seems appropriate that Gray should have selected the specific name *Lobbi* in preference to the older one, especially as another species bearing the same name was already in existence at that time. This species seems, however, to be little known.

R. subvestitum of Hooker and Arnott flowers freely in the Edinburgh Arboretum, and forms, when in full flower in spring, a very striking and pretty object, the flowers hanging down like those of a small flowered fuchsia. It has not, however, produced ripe fruit here.

IV. THE PLANTS IN THE PALM HOUSE AND TEMPERATE HOUSE. By R. L. HARROW.

Since the opening of the Palm House on the 1st of September last, nearly 150 species and varieties of plants have flowered, and the effects of the past exceptional summer are now visible in many ornamental and foliage plants, in their production of a more intense colour and greater substance in the leaves. The success attending the planting out of the occupants in the beds arranged for their reception has been entirely satisfactory. Planted in tubs, as these specimens formerly were, their growth was in some cases naturally stunted; since more root-action was allowed there has been produced a greater plenitude of both flowers and foliage. The palms in the Temperate House, which were formerly subjected to warmer treatment, are

now growing luxuriantly under a much lower temperature, *Bambusa arundinacea*, which started its first growth about the middle of August, has since thrown up five other shoots exhibiting great vigour. Another plant, *Euterpe edulis*, which, on account of its height, could not be placed in a more tropical position in the Palm House, is still producing foliage almost the size of that found under its original warmer temperature. As these plants are generally grown under tropical conditions, an interesting illustration of the fact that plants will often thrive in lower temperatures than those thought to be essential for their successful culture is presented.

During the past month many interesting, and several rare plants have flowered, a few of the most noticeable being the following:—

Euadenia eminens, a native of tropical Africa, and belonging to the order *Capparidæ*. Its flowers are borne upon a terminal inflorescence, are of a greenish-yellow colour, and are in considerable numbers. The two upper petals are about 4 inches in length, spread out in an upward position, while the two lower are almost suppressed. This plant has, to our knowledge, never been fruited under cultivation, and our attempts were unsuccessful, although pollen was produced in abundance.

Stapelia gigantea, of which a flower is exhibited, is noted, as its name implies, as being the largest of this remarkable genus, our largest flower measuring nearly a foot in diameter.

Aristolochia gigas, var. *Sturtevantii*, which was received by us in the spring of this year from Kew, has since planting produced five flowers, four others in different stages being still upon the plant. The dimensions of the largest flower were 14 inches across, 1 foot 8 inches long, exclusive of the tail of the flower, which, being included, gave it a total length of 5 feet 3 inches. This being the first occasion of its having flowered in Scotland, it is still a source of great attraction to visitors.

Amongst the many others worthy of remark are:—*Allamanda neriifolia*, *A. Williamsii*, *Crinum asiaticum variegatum*, *Eranthemum albiflorum*, *Ixora coccinea*, *Momordica Charantia*, *Luffa ægyptica*, *Jasminum hirsutum*, *Whit-*

fieldia lateritia, *Croton discolor*, *Medinilla venosa*, *Theobroma Cacao*, *Begonia sinuata*, *Costus igneus*, *Bignonia purpurea*, *Trichosanthes anguina*, *Astelia Banksii*, *Streptocarpus Dunnii*, *Rhodochiton volubile*, *Bauera rubioides*, *Tinea aethiopica*, *Pitcairnea Andreana*, *Jatropha podagrica*.

On the table are exhibited plants and cut specimens, in flower, of: *Gordonia anomala*, Spreng. = *Polyspora axillaris*, Don. and Roxb.,—a free-flowering shrub, of the order *Ternstroemiaceæ*, bearing white flowers; it is a native of Tropical and Sub-Tropical Asia, introduced in 1816. *Callicarpa purpurea*,—a native of India, bearing flowers in cymose clusters, which are very insignificant; but producing berries of a deep glossy violet colour. *Solanum Seaforthianum*,—a beautiful climbing plant, formerly figured in the "Botanical Magazine" as *S. venustum*. Introduced 1804. *Malpighia glabra*, Bardados cherry,—coming from West Indies, where it is sometimes cultivated for its fruit; its flowers, of a light pink colour, are produced late in the autumn from the axils of the leaves. *Globba Schomburghii*, from Siam, and *G. atosanguinea*, from Bornea,—species of a genus of *Scitamineæ*, remarkable for the development of root-tuber-buds in the axils of the lower bracts of the spicate inflorescence. These are commonly mistaken for the fruit of the plant, with which, however, they have no resemblance. *Clerodendron nutans*,—a creamy-white flowered species. *Gynura sarmentosa*,—a composite with dark-coloured phyllaries, and a peculiar, rather offensive, odour in the flowers. *Phyllanthus nivosus*, from South Sea Islands,—a very effective foliage euphorbiaceous plant.

MEETING OF THE SOCIETY,

Thursday, December 14, 1893.

Dr. CRAIG, Vice-President, in the Chair.

REGINALD MACLEOD, Queen's and Lord Treasurer's Remembrancer, and PERCIVAL C. WAITE, were elected Resident Fellows of the Society.

The CHAIRMAN informed the Society of the deaths of Rev. GEORGE GORDON, LL.D., and of A. STEPHEN WILSON, Non-Resident Fellows of the Society.

The TREASURER briefly stated the financial position of the Society, particulars of which he promised to communicate at the next meeting of the Society.

The following donations to the Illustration Fund were announced:—

Dr. Cleghorn,	£1	0	0
Sir J. D. Hooker,	2	2	0

Presents to the Library at the Royal Botanic Garden were announced, amongst them being the second fasciculus, completing the first volume of the "Index Kewensis."

Mr. RUTHERFORD HILL said—Among some Museum specimens, received a few days ago, was a specimen of the Malay fish poison, called Aker Tuba. It is the root of *Derris elliptica*, Benth., a papilionaceous woody climber, which grows wild on the plains in Perak, and is also rather extensively cultivated. The roots, known as Tuba root, are done up into bundles like the one I now exhibit. This one is quite dry, but as sold in the East they are in the fresh state, and have a rather pleasant aromatic, resinous smell, resembling that of fresh liquorice root. When cut, a milky juice exudes. This root has for a long time been used by the Malays for poisoning fish, the chopped roots being placed in the water. It also enters into the composition of the "Ipoh" arrow poison of Borneo. As it

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completely destroys the stock of fish in a stream, a law has been passed prohibiting its use. The root has also been extensively employed by Chinese gardeners for the destruction of the insect pests which infest gardens and greenhouses. It is interesting to note that another species, *D. uliginosa*, Benth., is employed as a fish poison on the Zambesi, in East Africa.

An examination of the root was made by M. Greshoff in 1891, but a more complete investigation was made last year by Mr. Leonard Wray, Curator of the Perak Government Museum. He found that 20 grains of the fresh root added to 1 gallon of water rapidly killed fish placed in it. By exhausting the root with alcohol, acidulated with hydrochloric acid, and evaporating, a gummy substance separated, and was collected and pressed into a mass. This proved to be the active principle, to which he gives the name of "tubain." Tubain is very brittle, reddish brown, quite insoluble in water, paraffin oil, and benzol, but soluble in alcohol, ether, and chloroform. It is not an alkaloid, but a resinous substance. The dried root yields 9.42 per cent. of tubain by the above process, but it is hardly probable that it has yet been obtained in a pure state. It is intensely poisonous. Mr. Wray found that 1 part of tubain in 350,000 parts of water proves quickly fatal to fish, and so small a quantity as 1 part in 1,000,000 parts of water killed fish in from 15 to 30 minutes. Mr. Wray suggests that this substance might be employed to destroy insect pests, and is well worthy the attention of makers of insecticides, and of floriculturists and horticulturists generally. This investigation being so recent, I have thought it would be of interest to the Fellows to see the specimen of the root which I have shown.

Miss MADDEN exhibited a cone of *Araucaria imbricata* from Argyllshire.

Professor BAYLEY BALFOUR exhibited models, by Deyrolle of Paris, of a section of tree-stem and of a grain of wheat, from the Museum of the Royal Botanic Garden; also the top of a specimen of *Abies grandis* blown down in one of the recent gales at Keir, and sent by Mr. Stirling-Maxwell

of Keir. The specimen was remarkable for the growths, in length, of the three past years it exhibited, the length of the stem being in each year over 4 feet.

The following Papers were read :—

OBITUARY NOTICE OF CHARLES JENNER. By ROBERT LINDSAY.

We have to record with great regret the death of Charles Jenner, which occurred at Easter Duddingston Lodge, Portobello, on 27th October 1893, in the eighty-fourth year of his age. Born at Chatham, Kent, on the 1st September 1810, he was sent, when thirteen years old, to learn the business which in after life he pursued with so much zeal and energy, and at the age of twenty he came to Edinburgh, founded, and carried on for fifty years, one of the most successful drapery establishments in the city.

Soon after settling in Edinburgh, Mr. Jenner became a member of the Philosophical Institution, and he attributed much of his success in after life to the valuable instruction he received there. His tastes directed him to literary and scientific pursuits, and he joined the Botanical Society in 1851, and found time during his busy life to contribute several papers to our Transactions. His attention was early directed to cryptogamic plants, and he devoted much time to the study of the unicellular Algæ. In 1867 he was elected President of this Society.

Mr. Jenner had an intense admiration of Scottish scenery, and took special delight in botanizing on our Scottish mountains; indeed, nearly all his holidays were thus spent. He began with the Pentland Hills, the geology of which first attracted him; this he followed up until there was scarcely a mountain district in Scotland that he did not know intimately.

In 1868, when President of this Society, he proposed the formation of an Alpine Botanical Club, on the plan pursued at some of the German universities, and a committee was appointed to consider the subject, but it never reported. The idea, however, was not lost sight of, for within two years the Scottish Alpine Botanical Club was formed at

Killin, of which Mr. Jenner was elected an Honorary Fellow on the 5th August 1873. During a botanical visit to Ross-shire and Inverness-shire in 1867, in company with Mr. Charles Howie of St. Andrews, Mr. Jenner discovered a small moss, which Professor Schimper of Strassburg regarded as a new species, and named *Didymodon Jennerii*, in honour of its finder;* and in the same excursion a handsome thistle was found, which has been named *Cnicus Carolorum* (the Charles thistle). Mr. Jenner suggested that the plant was probably a natural hybrid, and this view has been generally accepted, the parents of the form being *C. heterophyllus* and *C. palustris*. In August 1892, at Mr. Jenner's request, I visited the district where he had found the thistle twenty-five years previously, and I was enabled, from his accurate instructions, to find the plant, although its locality is limited to an area of a few yards in extent. A few young plants were brought to Easter Duddingston garden, but have not yet flowered.

Not the least of Mr. Jenner's services to botany and horticulture is the formation and maintenance for so many years of a garden which, in point of richness and interest, is second to none of the private collections of living plants in the kingdom. His garden had always the greatest attractions for him, and a brief account of its origin and outstanding features may be here given.† The grounds were laid out chiefly by the late William Gorrie, the late James Macnab also rendered valuable assistance. The garden now consists of about eight acres, devoted to a large collection of ornamental plants, with the exception of about an acre and a half of vegetable garden. The original rock-garden was constructed by Mr. Jenner and Mr. Howie in 1862, and consists of a series of raised beds, having their margins fitted with blocks of stone set on end, forming pocket-like spaces which were filled with special soil to suit the requirements of various alpine plants. The stone divisions thus prevent

* Figured and described in Trans. Bot. Soc. Edin., vol. ix. (1868), pp. 314, 315. It has since been shown that this is the *Oncophorus polycarpus* (Ehrh.), Brid. See Braithwaite's Moss Flora of Great Britain, I., p. 169.

† An account of the garden, being a paper entitled "A Scientific Garden," read at an evening meeting of the Edinburgh Naturalists' Field Club and Microscopical Society, on 23rd March 1892, with portraits of Mr. Jenner and Mr. Gorrie, and some views by Mr. John Lindsay, was printed for private circulation in 1892.

the more rampant-growing plants from mixing with and over-running the more delicate and slow-growing alpine. A large number of the plants in this part of the rock-garden were gathered by Mr. Jenner during his Highland excursions, the remainder consists of the best kinds of alpine of other countries that were in cultivation at the time. This was the first of this type of rock-garden constructed, so far as I know, in Britain; and that it has answered the purpose intended is witnessed by the fact that the majority of the original plants, planted thirty-one years ago, are still in perfect health and vigour. The raised beds were not stoned, but were simply planted with dwarf-growing shrubs or trees, many of which have been long since removed, as they had outgrown their positions, and in their place groups of lilies, ranunculus, anemone, and other showy plants have been substituted. All the rest of the rock-work at Easter Duddingston was designed by Mr. Gorrie. The best portion is a charming piece of artistic rock-work lying south of the original rock-garden, called by Mr. Jenner "Corriemore," as a memento of a botanical tour. This portion has been laid out in a different manner from the rest. The ground, instead of being raised, is excavated to a depth of about 8 feet, the excavations forming a high bank all round. Rough stones, placed firmly in the ground, support the mass of soil forming the banks, and give the sides a cliff-like appearance. A sloping narrow path runs round both sides, and reaches the bottom, now laid out as a bog-garden. The high banks afford ample protection for the growth of tender plants. Here such plants as *Chamaerops Fortunei*, *Aralia Sieboldi*, *Phormium tenax*, *Cordyline australis*, *Bambusa falcata*, *Quercus glabra*, *Ilex latifolia*, and other half-hardy plants, resist the most severe winters.

Adjoining "Corriemore" is an erection for the cultivation of hardy ferns. Under cover of a projecting roof, large blocks of sandstone are set up against a north wall, with spaces for soil. In this hardy fernery most of the British species with their varieties, and several North American species, are successfully cultivated. Some of the sandstone blocks have numerous apertures about 2 inches in diameter hollowed out, in which patches of *Arenaria balearica* are grown for the purpose of draping the stones. In the damper

portion of the fernery, the stones are covered with various liverworts.

Of late years several interesting features have been added to the garden. In 1887, Mr. Jenner, to utilize a piece of ground left vacant because unfit for ordinary garden purposes, conceived the idea of converting it into an iris garden. The ground was wet and clayey, and in digging out the clay, water was found at a depth of two feet. Good loam and peat soil having been substituted, the ground was laid out in square beds, with gravel walks intersecting them, the edges of the beds being formed by chips of granite set on end. Some of the best varieties of *Iris Kämpferi* were imported from Japan, with which the larger beds were filled. As many of the other species as could be obtained were planted separately, along with the best varieties of *Montbretia*. The Japanese irises proved to be magnificent varieties, with enormously large blossoms, both single and double flowers, in various shades of colour. At the edges of the beds are rows of the early-flowering Siberian *Iris reticulata* planted thickly, which in spring is very effective. All the plants are now thriving luxuriantly here, and what was little better than a clay pit, is now one of the most interesting features of Easter Duddingston garden. In 1889, the "Alpine Levels" were formed. This is an arrangement for growing alpine plants in beds—not as single specimens, but in masses. The beds are 32 in number. Each bed measures 9 by 7 feet, and is subdivided into four parts, to contain individually one species in mass, and as their flowering periods vary, the plants are so arranged that the interest is kept up throughout the year. The subdivision of the large beds into four is effected by longitudinal and transverse rows of an exceedingly dwarf-growing juniper—*Juniperus communis hibernica compressa*. Several specimens of this, planted in the original rock-garden thirty-two years ago, are at present only two feet in height, and are compact, symmetrical, handsome bushes, although they have never been cut or pruned. The large beds are edged with stone, and a gravel path runs round each. Numerous bulbs are planted on both sides of the stone margins, including snowdrops, snowflakes, winter aconite, crocuses, and anemones, which in spring are a beautiful

sight. The beds themselves are filled with gentians, primulas, aubrietias, saxifrages, sedums, dianthus, silenes, lithospermums, dwarf phloxes, etc., which produce masses of colour at different seasons of the year, rivalling the effects by tender bedding plants, besides being permanent and most interesting at all seasons.

Another important feature was added in 1889, viz., "The Climber Garden." This has proved an entire success. It consists of 50 circular beds, each 3 feet in diameter. A good stout spruce fir about 15 feet high is placed in the centre of each bed, round which the climbers cling for support, the remainder of the ground being taken up by gravel paths. No grass is used, in order that the climbers may be examined without getting the feet wet. Among the climbers are various kinds of clematis, jasmines, roses, *Aristolochia Siphon*, *Actinidia Kolumbika*, *Periploca graeca*, *Mutisia decurrens*, *Tropaeolum tuberosum*, *T. speciosum*, *Wistaria sinensis*, *Lathyrus latifolius*, hop, virginian creeper, etc. But none is more effective than the new climbing rose, "Crimson Rambler." The history of this rose is intimately connected with Easter Duddingston garden, and affords one of the many instances of Mr. Jenner's characteristic generosity. In 1878, Mr. Jenner received a consignment of plants from Japan, which he had commissioned Professor R. Smith, at that time Professor of Engineering at Tokio, to obtain for him. Among the plants thus received was this splendid rose, which Mr. Jenner named "The Engineer," in compliment to Professor Smith. The rose, which proved to be a new variety of *Rosa polyantha*, was much admired, and Mr. Jenner, wishing to spread such a good plant abroad and at the same time help a deserving man, presented, in 1889, the whole stock to Mr. John Gilbert, a small nurseryman at Lincoln in whom he was interested. Mr. Gilbert, in the following year, exhibited cut flowers of "The Engineer" at a meeting of the Royal Horticultural Society in London, when it was unanimously awarded a certificate of merit, but as he had not the means of placing the plant properly on the market, he obtained Mr. Jenner's permission to dispose of the stock to Mr. Charles Turner, of the Royal Nurseries, Slough. Turner changed its name to that of "Crimson Rambler,"

and it soon became famous in this country and in France. So recently as May last, the gold medal of the National Horticultural Society of France was awarded to it as the best new plant exhibited.

The garden at Easter Duddingston is specially rich in rare trees and shrubs. The late Mr. Gorrie had a free hand to purchase every hardy plant of interest when the garden was in course of formation, and no one knew better than he where such were to be obtained; consequently, many of the rarest trees and shrubs in cultivation are to be met with here, such as *Fagus Cunninghamii*, over 12 feet high; *Quercus Fordii*, 20 feet; *Plagianthus betulinus* (the "Ribbon Tree" of New Zealand), over 20 feet high, etc., the latter interesting as having been planted by Sir William Jenner in 1879, during a visit to his brother at Easter Duddingston. Dwarf-growing and pendulous varieties of trees are here very numerous, and nearly all the hardy species of *Rhododendron* are represented, besides maples, oaks, hollies, conifers, etc., in great variety. The entire collection of species and varieties of plants in the garden exceeds 4000.

Mr. Jenner could never be persuaded to take much interest in "in-door" plants. The taste for rare orchids and tender bedding plants he denounced, and would have none of them while there existed so many beautiful plants capable of withstanding our climate. The climate of Midlothian he held to be nearly perfect.

He cordially welcomed the various Natural History Societies throughout the country which paid a visit to his garden. After the death of his wife in 1880, he contemplated bequeathing his unique garden to the Edinburgh Naturalists' Field Club, but unfortunately this was not carried out. The school children of the district, and the children of the Edinburgh Industrial School, were frequently invited to spend a day at Easter Duddingston, and many will long remember the kindness shown on these occasions. Mr. Jenner took much interest in the Industrial School, and was one of its founders. To charitable objects he gave a great deal of help in an unostentatious manner. He enjoyed vigorous health, and to the last week of his life took the greatest interest in his garden, and was full of plans for its further development. His motto was "Endeavour ever,"

and his life justified its use. He will be remembered as one of our most successful merchants, a man of large-hearted charity, and a liberal encourager of scientific horticulture.

LIST OF BOTANICAL PAPERS BY MR. CHARLES JENNER.

1. A Comparative View of the more Important Stages of Development of the Higher Cryptogamia and Phanerogamia. Trans. Bot. Soc. Edin., vol. v., p. 55.
2. On the Accessory Organs of the Hybrid Selaginella. Trans. Bot. Soc. Edin., vol. viii., p. 169.
3. On the History and Structure of Urococcus. Trans. Bot. Soc. Edin., vol. viii., p. 318.
4. On the Study of Botany as a Branch of Mental Training. Trans. Bot. Soc. Edin., vol. x., p. 1.
5. Notice of a New *Carduus* gathered during a Botanical Excursion in Ross-shire. By Mr. Charles Howie and Mr. Charles Jenner. Trans. Bot. Soc. Edin., vol. ix., p. 257.
6. On Spores. Edin. New Phil. Jour., vol. iii., p. 269.

THE NON-ASSIMILATION OF ATMOSPHERIC NITROGEN BY GERMINATING BARLEY. (From Experiments made in 1880.)
By T. CUTHBERT DAY.

(With Zincographs, Figs. 1 and 2.)

The question of the direct fixation of atmospheric nitrogen by growing plants seems to have been an attractive problem to workers in the field of vegetable physiology, judging by the number of experimenters who have, at different times, attacked the subject. I believe it is generally acknowledged that plants, by themselves, are not able to make any direct use of the element which constitutes four-fifths of the atmosphere, though, by the aid of certain organisms which attach themselves to the roots of some plants, a direct assimilation of atmospheric nitrogen takes place, as has been amply proved by the researches of Hellreigel and Wilfarth, Berthelot, Frank, Schloësing, Lawes and Gilbert, and others. It is not my purpose to-night to deal with plants as they grow in the soil, but with the germinating seeds of a well-known cereal, namely, barley. Do the seeds of barley take up any nitrogen from the air during the germinating stage of growth? The question does not seem to be of much importance, but as, some years ago, I commenced to study some points in connection with the respiration of germinating barley, it was absolutely

necessary, from the nature of the experiments I required to execute, to satisfy myself whether nitrogen was active or not. I consequently went through a series of determinations on the point, and secured a number of concordant results, the outcome of which I thought might prove of interest to this Society, and I have taken this opportunity of laying them before you.

In a paper published in the Transactions of the Chemical Society (September 1880), I gave the results of three experiments on this subject, showing that atmospheric nitrogen takes no active part in the germination of barley.

Taking into consideration the short length of time occupied by each of those experiments, I thought it desirable to confirm the results then obtained by executing a fresh series of experiments, each extending over a longer period, and to observe the fluctuations in the volume of confined air from day to day.

The apparatus employed was the same as in the former experiments. It is seen in Fig. 1. A is a flask of about 100 c.c. capacity, with M.M. graduations on the neck, and carefully calibrated. The flask is inverted, with its mouth under the surface of mercury, in the small glass vessel B, and the whole is immersed in a large beaker full of water. The changes of temperature are observed by means of a thermometer, D. A small plug of platinum wire, in the neck of the flask, serves to keep the germinating corns in their place in the body of the flask. The specific gravity of the platinum plug and of the steeped barley was determined, so that their volume might be deducted from that of the air in the flask.

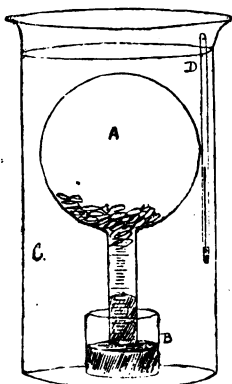


Fig. 1.

When the apparatus was arranged for an experiment, a portion of the confined air was withdrawn by means of a gas syringe, shown in Fig. 2—(The V tube A has a capillary bore; B is a pinchcock on the suction tube.)—and the quantity of nitrogen determined by analysis. At the end of

the experiment, another portion of air was taken from the

flask, and the quantity of nitrogen again determined. In calculating the volume of the confined air, the usual corrections were applied for temperature, pressure, and tension of aqueous vapour.

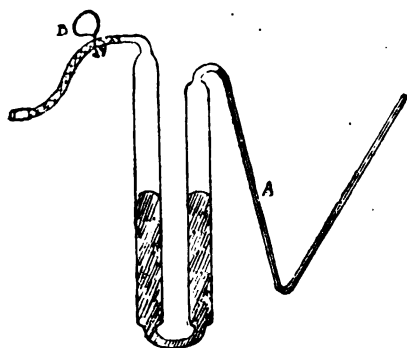


Fig. 2.

By the above means, we have the data necessary for ascertaining the quantity of atmospheric nitrogen present in the germinating flask at the commencement and end of each experiment. I give below the results obtained in the series of six experiments.

EXPERIMENT 1.—2,269 GRAMMES STEEPED BARLEY.
Temperature during Growth, 15·5° to 19·0° C.

VOLUME OF THE CONFINED AIR.		Difference.	State of Germination.
	C.C.	C.C.	
At start of Experiment, Aug. 5.....	99·08	—0·57	Budding.
Do. do. „ 6.....	98·51	—0·59	Growing freely.
Do. do. „ 7.....	97·92	+0·09	Do.
At end of Experiment, Aug. 8.....	98·01		Rootlets nearly as long as the corns.

COMPOSITION OF THE AIR IN THE FLASK.

	At start of Experiment.	At end of Experiment.
Oxygen	20·77%	6·29%
Nitrogen	79·23%	80·16%
Carbonic Anhydride.....	0·00%	13·55%
	<u>100·00</u>	<u>100·00</u>

VOLUME OF AIR—	C.C.	%	C.C.
At start of Experiment ...	99·08, containing	79·23 Nitrogen=	78·50
At end of Experiment, ...	98·01, „	80·16 „	=78·56
			Gain= 0·06

EXPERIMENT 2.—2,305 GRAMMES STEEPED BARLEY.
Temperature during Growth, 20·9° to 23·0° C.

VOLUME OF THE CONFINED AIR.		Difference.	State of Germination.
	C.C.	C.C.	
At start of Experiment, Aug. 11 ...	96·85	—0·24	Just budding.
Do. do. „ 12 ...	96·61	—0·36	Growing rapidly.
Do. do. „ 13 ...	96·25	+0·06	Do.
At end of Experiment, „ 14 ...	97·31		Root as long as corns.

COMPOSITION OF THE AIR IN THE FLASK.

	At start of Experiment.	At end of Experiment.
Oxygen	20·84%	0·23%
Nitrogen.....	78·99%	78·97%
Carbonic Anhydride.....	0·17%	20·80%
	<u>100·00</u>	<u>100·00</u>

VOLUME OF AIR—	C.C.	%	C.C.
At start of Experiment ...	96·85, containing	78·99 Nitrogen	=76·51
At end of Experiment ...	97·31, ,,	78·97 ,,	=76·84
			Gain = 0·33

EXPERIMENT 3.—2,138 GRAMMES STEEPED BARLEY.

Temperature during Growth, 13·0° to 15·8° C.

VOLUME OF THE CONFINED AIR.		Difference.	State of Germination.
	C.C.	C.C.	
At start of Experiment, Sept. 16 ...	95·79	—0·09	Just budding.
Do. do. ,, 17 ...	95·70	—0·63	Showing short root.
Do. do. ,, 18 ...	95·07	—0·56	Roots rather longer.
At end of Experiment, ,, 19 ...	94·63		Roots about $\frac{1}{2}$ length of corns.

COMPOSITION OF THE AIR IN THE FLASK.

	At start of Experiment.	At end of Experiment.
Oxygen	20·81%	6·77%
Nitrogen.....	78·9·15%	79·97%
Carbonic Anhydride.....	0·04%	13·26%
	<u>100·00</u>	<u>100·00</u>

VOLUME OF AIR—	C.C.	%	C.C.
At start of Experiment ...	95·79, containing	79·15 Nitrogen	=75·82
At end of Experiment ...	94·63, ,,	79·97 ,,	=75·67
			Loss = 0·15

EXPERIMENT 4.—2,144 GRAMMES STEEPED BARLEY.

Temperature during Growth, 13·2° to 17·0° C.

VOLUME OF THE CONFINED AIR.		Difference.	State of Germination.
	C.C.	C.C.	
At start of Experiment, Sept. 20 ...	99·54	—0·25	Just starting.
Do. do. ,, 21 ...	99·29	—0·30	Full bud.
Do. do. ,, 22 ...	98·99	—0·24	Short rootlets.
At end of Experiment, ,, 23 ...	98·75		Roots nearly $\frac{1}{2}$ length of corns.

COMPOSITION OF THE AIR IN THE FLASK.

	At start of Experiment.	At end of Experiment.
Oxygen	20·61%	7·82%
Nitrogen.....	79·36%	80·06%
Carbonic Anhydride.....	0·03%	12·12%
	<u>100·00</u>	<u>100·00</u>

VOLUME OF AIR—	C.C.	%	C.C.
At start of Experiment ...	99·54, containing 79·36 Nitrogen		=78·99
At end of Experiment ...	98·75, ,, 80·06 ,,		=79·06
			Gain = 0·07

EXPERIMENT 5.—2,296 GRAMMES STEEPED BARLEY.

Temperature during Growth, 15·3° to 15·5° C.

VOLUME OF THE CONFINED AIR.		Differ- ence.	State of Germination.
	C.C.	C.C.	
At start of Experiment, Oct. 26 ...	94·63		Starting.
Do. do. ,, 27 ...	94·35	- 0·28	Full bud.
Do. do. ,, 28 ...	94·10	- 0·25	Short root.
Do. do. ,, 29 ...	93·65	- 0·45	Growing steadily.
Do. do. ,, 30 ...	93·99	+ 0·34	Do.
Do. do. ,, 31 ...	95·63	+ 1·61	Do.
At end of Experiment, Nov. 1 ...	98·20	+ 2·57	Roots fully as long as corns.

COMPOSITION OF THE AIR IN THE FLASK.

	At start of Experiment.	At end of Experiment.
Oxygen	20·36%	0·05%
Nitrogen.....	79·64%	76·48%
Carbonic Anhydride.....	0·00%	23·47%
	<u>100·00</u>	<u>100·00</u>

VOLUME OF AIR—	C.C.	%	C.C.
At start of Experiment ...	94·63, containing 79·64 Nitrogen		=75·36
At end of Experiment ...	98·20, ,, 76·48 ,,		=75·11
			Loss = 0·25

EXPERIMENT 6.—2,268 GRAMMES STEEPED BARLEY.

Temperature during Growth, 15·5° to 15·7° C.

VOLUME OF THE CONFINED AIR.		Differ- ence.	State of Germination.
	C.C.	C.C.	
At start of Experiment, Nov. 6... ..	98·33		Just starting.
Do. do. ,, 7... ..	98·19	- 0·14	Full bud.
Do. do. ,, 8... ..	97·41	- 0·78	Short root.
Do. do. ,, 9... ..	97·26	- 0·15	Growing freely.
Do. do. ,, 10... ..	97·49	+ 0·23	Do.
Do. do. ,, 11... ..	98·62	+ 1·13	Do.
At end of Experiment, ,, 12... ..	100·87	+ 2·25	Long root.

COMPOSITION OF THE AIR IN THE FLASK.

	At start of Experiment.	At end of Experiment.
Oxygen	20.40%	0.00%
Nitrogen.....	79.57%	77.17%
Carbonic Anhydride.....	0.03%	22.83%
	<u>100.00</u>	<u>100.00</u>

VOLUME OF AIR—	C.C.	%	C.C.
At start of Experiment	98.33, containing	79.57 Nitrogen	=78.23
At end of Experiment ...	100.87, „	77.17 „	=77.84
			Loss = 0.39

RESULT OF THE SIX EXPERIMENTS—GAIN OR LOSS OF NITROGEN.

	Gain C.C.	Loss C.C.
Experiment 1.	0.06	—
„ 2.	0.33	—
„ 3.	—	0.15
„ 4.	0.07	—
„ 5.	—	0.25
„ 6.	—	0.39
Sum.....	<u>0.46</u>	<u>0.79</u>

The total loss of nitrogen in the six experiments is therefore $0.79 - 0.46 = 0.33$ C.C., or an average loss of 0.055 C.C. nitrogen in about 80 C.C. for each experiment, a quite inconsiderable quantity, and well within the limit of experimental error.

The result arrived at shows pretty conclusively that atmospheric nitrogen takes no active part in the germination of barley. An examination of the daily differences in the volume of the confined air in Experiments 5 and 6, reveals the fact that when the oxygen becomes nearly exhausted, the volume of air increases owing to the evolution, by the seeds, of more carbonic anhydride than can be accounted for by true respiration. The cause of this is no doubt due to intercellular fermentation.

The germination of the barley in all the experiments, even in those occupying the longer period, was perfectly healthy, and no still corns were met with. The corns, when extracted from the flask, had that peculiar fragrant odour which is always noticed in barley when germinated in a confined space.

RECORDS OF SCOTTISH PLANTS FOR 1892. By ARTHUR BENNETT.

Again I submit the principal records among the additions to local Scottish Botany, being additional comital plants not represented in Topographical Botany, or since recorded by me. As before, full lists appear in the "Annals of Scottish Natural History," pp. 95, 101, 1893.

One species is new to Scotland—i.e., *Orobanche cruenta*, Bert.; but it will be desirable to try and refine it near Oban before full descriptions, etc., appear.

In Dumfries Mr. J. T. Johnstone has continued his careful examination of the flora, and added several interesting species, among them *Vicia Orobus*, *Scutellaria minor*, and *Salix lapponica*.

In Wigtown Mr. J. M'Andrew has found *Malva rotundifolia*, *Carex pendula*, *Melica uniflora*, etc.

In Selkirk the Rev. E. S. Marshall and Mr. Boyd have added thirty species to its flora, many of interest, such as *Rosa involuta* and *sepium*, *Cicuta*, *Potamogeton prælongus*, *P. plantagineus*, and *Carex filiformis*.

To Roxburgh, *Utricularia neglecta*.

In Stirling Mr. Kidston and Colonel Stirling have continued their study of its flora, and found, among many more, *Ranunculus Lenormandi*, *Convallaria majalis*, *Triticum caninum*, etc.

To Lanark, W. Perth, Aberdeen, Dumbarton, Clyde Isles, N. Ebudes, W. Ross, and Caithness one species each has only been added.

To M. Perth three—*Hieracium prælongum*, *H. angustatum*, *H. Sommerfeltii*.

To E. Perth seven—*Lastrea æmula* and *Hieracium flocculosum*, etc.

For Forfar Mr. Marshall has six and Professor Traill one—*Lepigonum neglectum*, *Utricularia neglecta*, *Orchis mascula* at 2900 feet (Watson's highest 1500 feet).

To Kincardine Professor Traill adds two species.

To Aberdeen, S., Professor Traill adds two. The Rev. Mr. Marshall found *Stellaria nemorum* at 3000 feet (1200 feet, Watson), and *Potamogeton perfoliatus* at 2300 feet (1200 feet, Watson's highest).

To Easterness (E. Inverness) the Rev. Mr. Marshall has recorded twenty-two additional plants,—*Arctium nemorosum*, *Atriplex littoralis*, *Zostera nana*, etc.

To Westerness (W. Inverness) Mr. S. M. Macvicar continues to add.

Five are added to Argyll, the *Orobanche* before mentioned, etc.

In E. Ross the Rev. Mr. Marshall has succeeded in finding many additions, and among them *Cochlearia grœnlandica*, L. (non Smith), *Hieracium flocculosum* (Bailey herb), *Potamogeton rufescens*, *P. nitens*, *P. pusillus*, *Aira uliginosa*, etc.

In E. Sutherland Mr. Marshall finds *Cherleria sedoides*, etc., *Carex pauciflorus*.

To the Outer Hebrides Mr. W. S. Duncan adds *Raphanus maritimus*, *Centunculus*, *Juniperus communis*.

Summary of Records from Scottish Counties for 1892.

No.		No.	Brought forward,
72.	Dumfries, 9	96.	Easterness, 24
74.	Wigtown, 9	97.	Westerness, 9
77.	Lanark, 1	98.	Argyll, 5
79.	Selkirk, 30	99.	Dumbarton, 1
80.	Roxburgh, 1	100.	Clyde Isles, 1
86.	Stirling, 17	104.	Ebudes, N., 1
87.	Perth, W., 1	105.	Ross, W., 1
88.	„ Mid., 3	106.	„ E., 30
89.	„ E., 6	107.	Sutherland, E., 12
90.	Forfar, 7	108.	„ W., 1
91.	Kincardine, 2	109.	Caithness, 1
92.	Aberdeen, S., 5	110.	Outer Hebrides, 6
93.	„ N., 1		
Carry forward, 92		Total, 184	

A very interesting inquiry would be into the aquatic vegetation of the Lakes of Scotland and their temperature, colouration, transparency, and biological conditions.

To any one willing to undertake any county I would advise them to consult Dr. Maguire's interesting account of the sixty-three lakes of the Jura mountains, entitled—“*Recherches sur la Végétation des Lacs du Jura*,” Paris, 1893. It appeared in “*La Revue Générale de Botanique*,” vol. V., pp. 241–297 and 303–316, 1893.

Professor Bayley Balfour remarked on the important results that a systematic investigation of the flora and biological conditions of our Scottish lakes would supply, and reminded the Society that a Committee of the British Association was appointed at the Newcastle meeting for the purpose of carrying out such an investigation. So far, however, no results had been obtained, but the proposal was one which the members of the Society should endeavour to carry out.

BOTANICAL NOTES FOR THE MOFFAT DISTRICT, 1893.
By J. THORBURN JOHNSTONE, Moffat.

This summer (1893) I visited a number of the small out-of-the-way Linns in the district, such as Harthope and Greskine in Evan Water, Greigsland Burn, Dykehead Linn, Duff Kinnel and its tributaries in Johnstone, and various other places. No new plants were recorded, but new stations were found for several of our uncommon plants, showing that they have a wider distribution in the district than might be inferred from the position of the previous recorded stations. Among the most interesting of these plants were—

Pyrola secunda, gathered in one of the tributaries of Duff Kinnel, this being 16 miles from the nearest of the five stations for it previously known to me.

Hieracium sparsifolium. Also in Duff Kinnel; but the plants are much more luxuriant in their habit than those to be gathered at Beef Tub and Craigmichen Scaurs.

Cardamine impatiens. This I found growing in the stackyard at Middlegill, and it is also growing very abundantly as a garden weed in Kirkpatrick-Juxta Manse garden. It was on the roadside near this manse I found it growing in 1891, when it was reconfirmed for the district. The Rev. Mr. Little (a former minister of the parish), who was an ardent botanist, would most probably plant it in the garden some time during his incumbency, where it has thriven so well as to have now become a regular weed, and the specimens I originally gathered on the roadside must have spread from the garden.

The inside of the garden wall at the Manse is also covered with *Ceterach officinarum*, Willd., which in all

probability would be planted by the Rev. Dr. Singer or Mr. Little.

The Rev. Wm. Brodie, the present minister, informs me that both plants have been growing there in abundance all the time he has been resident there.

Arctostaphylus Uva-ursi, Correferron, also a second station.

With the exception of the *Hieracia*, I have only two plants to record as new to the district. Unfortunately, they are only casuals, and are *Scandix pectenvenensis*, casual in garden, and *Sonchus arvensis*, waste ground at Birnock.

In the "Journal of Botany" of May, June, and July 1893, the Messrs. E. F. and W. R. Linton publish a list of *Hieracia* gathered by them in Scotland, a number of them having stations in this district. They have since named specimens of nearly all of them in a collection I sent up to them for that purpose. Their list, applicable to this district, is as follows:—

- Hieracium centripetale*, F. J. Hanbury.
 „ *clovense*, Linton.
 „ *callistophyllum*, F. J. H.
 „ *Langwellense*, F. J. H.
 „ *Schmidtii*, Tausch.
 „ *buglossoides*,* Arvet-Touvet.
 „ *argentum*, Fries.
 „ *nitidum*, Backhouse.
 „ *stenolepis*, Tindel.
 „ *stenolepis*, var. *anguinum*, W. R. Linton.
 „ *Sommerfeltii*, Tindel.
 „ *rubicundum*, F. J. H.
 „ *murorum*, Linn.
 „ *murorum*, var. *ciliatum*, Almq.
 „ *murorum*, sub. sp. *sarcophyllum*, Stenstrom.
 „ *duriceps*, T. S. H.
 „ *euprepes*, F. J. H.
 „ *stenophyes*, W. R. L.
 „ *angustatum*, Tindel.
 „ *strictum*, Fr. var. *subcrocatum*, Linton.

* Mr. Linton makes out that the *Hieracium* gathered by Mr. Backhouse at the Grey Mare's Tail in 1850, and named by him *H. saxifragam*, is the *H. buglossoides* as above. I referred to this plant in a former paper.

The above *Hieracia* are pretty evenly distributed over the sub-alpine Linns of the district, as Blacks Hope, Correferron, Midlaw Burn, Andrew Whinney, White Coomb, Grey Mare's Tail, Craigmichen Scaurs, Beef Tub, etc.

NOTES ON THE FLORA OF FIFE AND KINROSS. By CHARLES HOWIE.

I.—ADDENDA TO THE MOSS FLORA OF FIFE AND KINROSS.

296. *Zygodon Stirtoni*, Sch. Registered as a variety of *Z. viridissima* in "Moss Flora," page 52. With the consent of Professor Lindberg and others, it has been retained as a species, as named by Professor Schimper.
297. *Ephemerum serratum*. Sparingly found at Tayport and St. Andrews, as registered in Ballingal's "Shores of Fife;" refound near Wormet, 1892, by Mr. Fulton.
298. *Dicranella curvata*. By the side of a small ditch, East of Fife; abundant.
299. *Dicranella fulvellum*. Among the cliffs on one part of the east sea cliffs.
300. *Racomitrium sudeticum*. On rocks, Drumcarro Craig; registered in Ballingal's "Shores of Fife," 1872; refound near Denork ground, 1891.
301. *Racomitrium ellipticum*. East sea coast and Drumcarro Craig.
302. *Trichostomum brachydontium*. On Dunbarnie Links.
303. *Polytrichum gracile*. Registered, on the Tents Muir, sparingly, Ballingal's "Shores of Fife;" refound again on the Tents Muir, 1889.
304. *Amphoridium Mougeotii*. On the upper range of the Lomonds; species, irrespective of numerous varieties.

II.—STATISTICS OF THE FLORA OF FIFE AND KINROSS REGISTERED AS SPECIES UP TO DECEMBER 1893.

Dicotyledons, 781; *Monocotyledons*, 213; *Pteridophyta*, 43; *Musci*, 306; *Hepaticæ*, 40; *Algæ marinæ*, 248, including a species of *Melobesia* new to the country, in rock pools on the tidal beach, east coast; *Desmidiæ*, 124, principally

collected by Mrs. Farquharson; *Lichenes*, 89; *Fungi*, 59, not including the microscopic species. There are several rare species collected in October 1872—*Trametes peronatus* and *Hygrophorus chlorophanus*, and a species new to Britain, *H. meisneriensis*, of a bluish colour, and gelatinous, as attested by Mr. W. Smith, of London.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING NOVEMBER 1893. By ROBERT LINDSAY, Curator.

During November the thermometer was at or below the freezing point on sixteen mornings, indicating collectively 55° of frost for the month, as against 41° for the corresponding month last year. Falls of rain, snow, and sleet were frequent. The severe northerly gale which passed over the country on the 18th and 19th, with such disastrous effects in various quarters, did no damage at the Gardens. The lowest readings of the thermometer were on the 1st, 25°; 4th, 25°; 5th, 28°; 21st, 24°; 22nd, 26°. Very few plants are now in flower out of doors, vegetation being in an almost dormant condition. Not any plants came into flower during November on the rock-garden.

Readings of exposed Thermometer at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during November 1893.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	25°	41°	49°	16th	33°	40°	56°
2nd	33	40	47	17th	38	44	54
3rd	33	40	49	18th	33	35	38
4th	25	35	43	19th	29	32	39
5th	28	32	46	20th	31	36	41
6th	31	34	46	21st	24	26	44
7th	32	38	43	22nd	26	36	42
8th	32	39	45	23rd	28	34	54
9th	36	39	46	24th	33	42	44
10th	38	40	46	25th	40	43	52
11th	33	40	50	26th	31	34	51
12th	40	46	53	27th	29	40	53
13th	30	38	52	28th	36	41	53
14th	28	38	44	29th	38	48	53
15th	28	37	44	30th	35	41	43

II. METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF NOVEMBER 1893.

Distance from Sea, 1 Mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direc- tion.	
		Max.	Min.	Dry.	Wet.					
		°	°	°	°					
1	29·420	43·9	30·2	43·8	42·8	W.	Cum.	10	W.	0·095
2	29·404	46·1	34·3	40·3	39·1	W.	...	0	...	0·020
3	29·626	45·9	36·1	41·8	41·1	W.	Nim.	10	W.	0·810
4	29·885	42·9	29·8	32·2	32·0	W.	...	0	...	0·090
5	29·629	40·9	28·8	35·9	35·0	W.	...	0	...	0·020
6	30·151	41·8	30·6	34·1	32·1	N.W.	...	0	...	0·000
7	30·367	42·9	32·4	39·8	36·8	N.	Cum.	5	N.	0·000
8	30·381	41·7	34·8	39·5	37·6	N.W.	Cum.	10	N.	0·000
9	30·446	44·9	38·9	41·1	40·0	N.E.	Nim.	10	N.E.	0·005
10	30·420	44·9	40·9	41·8	39·1	N.E.	Cum.	10	N.E.	0·000
11	30·446	45·0	33·9	40·3	39·6	Var.	Cum.	10	N.E.	0·075
12	30·414	46·2	40·0	43·9	41·6	E.	Cum.	10	E.	0·000
13	30·144	44·9	33·0	38·1	37·6	E.	...	0	...	0·000
14	29·758	45·6	30·2	37·2	36·9	W.	Cum.	10	S.E.	0·000
15	29·820	41·9	31·1	38·1	37·0	W.	Cum.	10	E.	0·010
16	29·743	42·9	36·3	41·1	38·6	S.	Cum.	10	S.	0·010
17	28·485	53·8	41·2	53·2	50·1	S.	Cum.	10	S.	0·090
18	29·461	53·8	36·9	37·2	31·0	N.E.	Cum.	10	N.E.	0·000
19	29·930	37·2	29·2	33·7	31·0	N.E.	Cum.	1	N.E.	0·000
20	30·313	37·9	33·0	37·8	35·2	N.E.	Cum.	9	N.E.	0·000
21	30·461	39·8	28·2	28·9	28·1	N.W.	...	0	...	0·115
22	29·884	44·3	28·2	36·4	34·8	W.	...	0	...	0·000
23	30·153	38·9	29·9	35·1	32·9	N.W.	Cir. St.	6	N.	0·000
24	29·889	43·8	34·7	43·8	41·7	N.W.	Cir. St.	10	N.W.	0·060
25	29·432	48·7	43·5	45·9	45·1	W.	Nim.	10	W.	0·060
26	29·650	51·0	33·9	36·0	32·8	N.W.	...	0	...	0·000
27	29·997	40·6	29·6	40·6	39·2	S.W.	Cir. St.	10	W.	0·025
28	29·853	52·9	40·2	52·6	51·1	W.	{ Cir. Cum.	2 1 }	W.	0·000
29	29·689	55·0	51·0	51·2	48·2	W.	Cum.	10	W.	0·000
30	29·603	52·5	41·2	41·9	40·0	N.W.	Cir. St.	10	W.	0·040

Barometer.—Highest Observed, on the 21st, = 30·461 inches. Lowest Observed, on the 17th, = 28·485 inches. Difference, or Monthly Range, = 1·976 inch. Mean = 29·895 inches.

S. R. Thermometers.—Highest Observed, on the 29th, = 55°·0. Lowest Observed, on the 21st and 22nd, = 28°·2. Difference, or Monthly Range, = 26°·8. Mean of all the Highest = 45°·1. Mean of all the Lowest = 34°·7. Difference, or Mean Daily Range, = 10°·4. Mean Temperature of Month = 39°·9.

Hygrometer.—Mean of Dry Bulb = 40°·1. Mean of Wet Bulb = 38°·3.

Rainfall.—Number of Days on which Rain fell = 15. Amount of Fall = 1·525 inch. Greatest fall in 24 hours, on the 3rd, = 0·810 inch. Very light shower of Snow, first observed for season, on the 19th.

A. D. RICHARDSON,
Observer.

III. ON PLANTS IN THE PLANT HOUSES. By R. L. HARROW.

The past month, as might be expected, has shown a gradual decrease in the number of flowering plants, and a comparison of November with October in this respect exhibits a falling off of rather more than a third of the species which have been seen in flower in the plant houses of the Royal Botanic Garden. The usual winter-flowering florists' flowers have done much to brighten up the respective houses; but, apart from these, several representatives of interesting tropical and temperate genera, which are not generally to be seen in cultivation, have produced their blooms. Specimens of some of these are exhibited.

Napoleona cuspidata, Miers. This plant is a native of Old Calabar, belonging to the order Myrtaceæ. The genus was first discovered about the close of the last century by Baron Palisot de Beauvois, the species first discovered being *N. imperialis*, Beauv. The genus has since, says Sir W. Hooker in the "Botanical Magazine," attracted the attention of botanists in no ordinary degree, on account of the extraordinary structure of its flowers, and scarcely two of them have described it in the same way. The species named above was verified by Dr. Masters in the "Gardeners' Chronicle" of 1866, from flowers received from the Edinburgh Botanic Garden. On comparing these with flowers of *N. imperialis* at the Royal Gardens, Kew, he saw at once he had a different species, and dried specimens in the herbarium of Mr. Miers enabled him to determine with accuracy the identity of the plant. Up to 1886 the plant had been under cultivation as *N. imperialis*.

Banksia collina, R. Br. Under the name of *B. littoralis* this proteaceous plant was figured in the "Botanical Magazine" t. 3060, from a specimen sent from the Edinburgh Botanic Garden in 1830, and the plant exhibited was struck as a cutting some fourteen years ago from the original plant, now dead. Besides the above synonym, it has also been grown under those of *B. Cunninghamii*, Sieber, and *B. ledifolia*, A. Cunn. Species of *Banksia* which are seldom seen in cultivation outside

of our Botanic Gardens, are natives of Australia, some growing to a height of 20 feet; the foliage is strikingly handsome, usually serrated, dark-green above, covered with silvery hairs on the under surface; the inflorescence takes some considerable time to develop. The plant exhibited has now been in flower for more than two months.

Whitfieldia lateritia is an acanthaceous shrub, named after Mr. T. Whitfield, a botanical collector, and is a native of tropical Africa. The genus consists of only two species the one under notice being the only one as yet introduced to cultivation. Its terminal racemes of flowers are produced in October, continuing to bloom till late in the spring months.

Corynostylis Hybanthus, Mart. — This pretty stove climbing shrub is remarkable as being a member of the order *Violariæ*, and was introduced from Para in 1870. The flowers are produced freely, in racemes; the lower petal of the flower, which is the largest, forms a long spur, somewhat like that of a large white violet. A fine figure of the plant will be found in the "Botanical Magazine," 5960. It is rarely met with under cultivation. Sir J. Hooker describes it as a very variable species, being of the opinion that all the so-called species of the genus hitherto described are referable to one.

Manettia bicolor: — Producing its bright scarlet and yellow flowers in abundance from the axils of the light green leaves, this plant is well worthy of a place in our collections. Messrs. Veitch are credited with the introduction of this species in 1843, from the Organ Mountains. Treated as a climbing plant, in a warm greenhouse, it exhibits its true character to perfection. Belonging to the order *Rubiaceæ*, it is closely allied to *Bouvardia*.

In addition to these, there are on the table: *Centropogon Lucyanus*, Hort., — a hybrid between the Mexican *C. fastuosus*, Scheidw., and the Brazilian *Siphocampylus betulæfolius*, Don., raised by M. Despond at Marseilles, 1856. *Crassula lactea*, Soland., — a Cape plant. *Wallichia densiflora*, Mart., — from East Indies. *Plumbago rosea*, Linn., — an Indian plant. *Cuscuta reflexa*, Roxb., — from India; and the beautiful winter-flowering East Indian *Ipomœa Horsfalliæ*, Hook, var. *Rheedii*, and var. *Briggsii*.

Of the other plants which have flowered may be noted: *Begonia incarnata*, Link and Otto,—from Mexico; the tropical African *Draena fragrans*, Ker-Gawl, and the East Indian *D. angustifolia*, Roxb.; *Kennedya prostrata*, R. Br., var. *Marryattæ*, the finest variety of this Australian climber; *Aloe ciliaris*, Haw., from South Africa; *Rhipsalis rhombea*, Pfeiff, and *R. salicornoides*, Haw., two Brazilian plants; and *Erythroxylon Coca*, Lamk., from Peru.

THE BOTANY OF THE PILCOMAYO EXPEDITION; BEING A LIST OF PLANTS COLLECTED DURING THE ARGENTINE EXPEDITION OF 1890-91 TO THE RIO PILCOMAYO. The Identifications and the Description of New Species by Mr. N. E. BROWN, Assistant in the Herbarium, Royal Gardens, Kew. By J. GRAHAM KERR, Naturalist to the Expedition.

(Read April 1893.)

The following is a list of a small collection of plants, with description of their species, brought by me from Fortin Page—the farthest point reached by the unfortunate Argentine Expedition of 1890-91 to the Rio Pilcomayo, in the Gran Chaco of South America. For particulars of the expedition, and of the region of whose flora these plants form a part, I would refer to the preliminary notice published in Trans. Bot. Soc. vol. xix. page 128, and will here only premise a few words in the nature of an introduction. The specimens contained in this list were collected within a few miles radius of Fortin Page, situated on the banks of the River Pilcomayo, some 300 miles from its mouth measured along its very tortuous course.

Though few in actual number of species, the list will be found to give a tolerably characteristic idea of the phanerogamic flora of the more central and low-lying parts of the Gran Chaco, a region consisting of wide-spreading palm-dotted llanos, varied here and there by patches of hardwood forest, or wide-spreading swamp. This low-lying part of the Chaco is subject to wide-spreading inundations, during which enormous areas remain under

water for several months at a time; and at other times to the opposite extreme of climatic conditions, when it undergoes a prolonged parching and dessication, during which the soil becomes saturated with saline matters. Under such circumstances, the poverty of the ordinary plain flora is still further accentuated. The flora of these inner low-lying parts of the Chaco offering a striking contrast to the mild, semi-tropical luxuriance of the riverain regions along the great fresh-water streams.

I am indebted to Mr. W. Botting Hemsley, of Kew, for the following note regarding the collection I made. "Amongst the 200 species are a score or so of novelties. As will be seen, they mostly belong to well-known genera; but the new genus *Diplokeleba* and *Quebrachia Morongii* are specially interesting. The former belongs to the Sapindaceæ, and is remarkable in having a double cup-shaped disc. *Quebrachia* belongs to the Anacardiaceæ, and differs from the only previously known species, in having simple leaves. Much yet remains to be done in working out the flora of the sub-tropical part of the Argentine Republic. Most of the novelties collected by Tweedie in the region of Buenos Ayres, nearly sixty years ago, still lie undescribed in the Kew Herbarium. Doubtless many of them were described from other collections by the late Dr. Grisebach in his *Symbolæ ad Floram Argentinam*, published in 1879. In that work he enumerates 2265 species of vascular plants, 31 per cent. of which he regarded as endemic, and 24 per cent. of them were common to Brazil and Paraguay. Many interesting particulars of the flora may be gleaned from the work in question; and G. Hieronymus has more recently published further novelties in his *Icones et Descriptiones Plantarum Argentinarum*.

I desire to thank the Director of Kew for the readiness with which he allowed my collection to be determined in the Herbarium of the Royal Gardens, and the officials of the Herbarium I thank for the courtesy they showed me. I have especially to acknowledge the services of, and to thank Mr. N. E. Brown, who undertook the working up of the collection, and the identification and naming of the species, with the exception of the orchids, the

names of which I owe to Mr. R. A. Rolfe. My own work has been limited to merely adding a few notes as to locality, and other details of interest. To Professor Bayley Balfour I would also wish to record my deep gratitude for the interest he has shown throughout, both in the conduct and in the results of the Pilcomayo Expedition.

CLEMATIS BONARIENSIS, DC.

Hab.—Banks of Rio Paraná. Colonia Hernandá. Fl. Jan.

CISSAMPELOS PAREIRA, L.

Hab.—Rio Pilcomayo.

VICTORIA CRUZIANA, d'Orb.

Hab.—Lateral lagunas of Rio Paraguay.

Maiz del Agua, Yrupe.

Leaves 4–6 feet across; rim 3 inches high; upper surface smooth, dark green; lower divided into quadrangular compartments, bright carmine. Flowers said to be about a foot across, pinkish violet, and with beautiful scent. As the name *Maiz del Agua* indicates, the provincials use the seeds for food.

CAPPARIS RETUSA, Griseb.

Hab.—Monte, near Fortin Page.

CAPPARIS TWEEDIANA, Eichl.

Hab.—In the montes around Fortin Page. A small tree about 15 feet in height.

IONIDIUM GLUTINOSUM, Vent.

Hab.—Rio Pilcomayo. Common in the open campo. Fl. 1st Nov.—1st Jan.

XYLOSMA VENOSUM, N. E. Br. (n. sp.).—Arbor dioicus spinosus, ramis spinis folisque glabris; foliis coriaceis valde venosis petiolatis ovatis vel subrhomboideo-ellipticis obtuse acutatis, basi cuneato-acutis, crenato-dentatis, dentibus subtus apice glanduliferis, glandulis ad petiolos decurrentibus; floribus axillaribus dense fasciculatis breviter pedicellatis, pedicellis ad medium articulatis, bracteis late ovatis vel ellipticis, obtusis, ciliatis, extus subpuberulis, sepalis 5–7, valde imbricatis, ovatis vel

ellipticis obtusis, ciliatis intus pubescentibus, disco crenato, masculis staminibus 20-30, fœmineis ovario glabro stylis 2-4, baccis globosis, seminibus 3-4. *Myroxylon Salzmanni*, Morong and Britton in Ann. New York Acad. Sc. vii., p. 52, not of Kuntze.

Hab.—Paraguay; Asuncion, Gibert, 10! 1026! Rio Pilcomayo, Kerr!

Spini $\frac{3}{4}$ – $1\frac{1}{2}$ poll. longi. Folia $1\frac{1}{4}$ – $2\frac{1}{2}$ poll. longa, $\frac{3}{4}$ – $1\frac{3}{4}$ poll. lata. Petioli $\frac{1}{4}$ – $\frac{3}{8}$ poll. longi. Pedicelli 1–2 lin. longi. Sepala $\frac{3}{4}$ lin. longa. Bacca 2 lin. diam.

According to Gibert this is a large tree, called *Nuatipunta* by the natives. The plant collected at Uberaba, in Minas Geraes, by Regnell (No. 1534), I believe also belongs to this species; but the leaves are larger (up to 3 inches long by 2 inches broad), and the crenations more numerous and finer; in all other respects it perfectly agrees with the plant here described, the leaves having the same peculiarity of being glandular-decurrent on the petioles, by which character it may be at once distinguished from *X. Salzmanni*, Clos., to which it is wrongly referred by Eichler in the Flora Brasiliensis (N. E. Brown).

POLYGALA PARAGUAYENSIS, A. W. Benn. (Syn. *P. areguensis*, A. W. Benn.).—I see no distinction between the plants described under the above names. *P. areguensis* is evidently perennial, and not an annual as stated by Bennett (N. E. Brown).

Hab.—Fortin Page. In grass by the edge of the monte. Fl. 8th Oct.

PORTULACA sp.

Hab.—Rio Pilcomayo.

MALVASTRUM TWEEDIEI, Baker fil.

Hab.—Fortin Page. Damp open spots. Fl. 9th Oct.

SPHÆRALCEA BONARIENSIS, Griseb.

Hab.—Rio Paraná. Colonia Hernandá. Fl. Jan.

PAVONIA CONSOBRINA, N. E. Br. (n. sp.).—*P. hastata* similis sed foliis minus hastatis crenato-dentatis, pedicellis quam petiolis non longioribus, involucri bracteis linearibus vel anguste oblanceolato-oblongis quam calyce distincte longioribus, et corolla calyce vix excedente differt.

Hab.—Uruguay; Montevideo, Gibert, 126! 351! Rio Pilcomayo, Kerr, 66!

Petoli $\frac{3}{8}$ –1 poll. longi. Pedicelli $\frac{1}{8}$ – $\frac{1}{4}$ poll. longi. Involucri bracteæ $\frac{1}{4}$ – $\frac{3}{8}$ poll. longæ, $\frac{1}{4}$ – $\frac{1}{2}$ poll. latæ. Corolla $\frac{1}{4}$ poll. longa.

This plant much resembles *P. hastata*, but may be at once distinguished by the pedicels being shorter than, or about equalling, the petioles, and by the involucral bracts distinctly exceeding the calyx. The articulation of the pedicels, too, appears to be much closer to the flower, and the leaves are less hastate, and their toothings more rounded. In *P. hastata* the pedicels are much longer than the petioles, and the involucral bracts are spatulate-ovate and shorter than the calyx. Although the corolla in all the specimens of *P. consobrina* that I have seen is small, and scarcely exceeds the calyx, yet the flowers are certainly not cleistogamous, though possibly a cleistogamous form may exist, as in the case of *P. hastata* (N. E. Brown).

In shady spots by river side near Fortin Page. Fl. 1st Nov.

HIBISCUS CISPLATINUS, St. Hil.

Hab.—Marshy spots—Paraná Delta, Rio Paraná, Rio Paraguay, Rio Pilcomayo. Fl. (Pilcomayo) 11th Dec.

FUGOSIA SULPHUREA, Juss.

Hab.—Open campo near Fortin Page. Fl. 15th Oct. Corolla yellow, with crimson centre.

MELOCHIA PYRAMIDATA, L. var. Hieronymi, Schum.

Hab.—Rio Pilcomayo.

MELOCHIA TOMENTOSA, L.

Hab.—Rio Pilcomayo.

BUETTNERIA FILIPES, Mart.

Hab.—Rio Paraguay.

STIGMAPHYLLON CALCARATUM, N. E. Br. (n. sp.).—Foliis oppositis, breviter petiolatis, oblongis vel lanceolato-oblongis obtusis, mucronatis, basi breviter mucronato-sagittatis, marginibus subintegris absque glandulis supra subtusque glabris, vel subtus sparse pubescentibus petiolis dense adpresse pubescentibus apice biglandulosis; pedun-

culis axillaribus, adpresse pubescentibus, apice bibracteatis, umbellatim paucifloris; bracteis foliis simillimis, subsessilis, basi biglandulosis, pedicellis adpresse pubescentibus, medio bibracteolatis; floribus flavis, calycis lobis late ovatis obtusis glandulis magnis, staminibus glabris, stigmatibus foliaceis late ovatis, subcucullatis.

Hab.—Bolivia; Marsh near Corumbā, Moore, 1012. Rio Pilcomayo, Kerr.

Folia 1–2½ poll. longa, ½–1 poll. lata. Pedunculi ½–2½ poll. longi. Bracteae ½–¾ poll. longae. Pedicelli ¼–½ poll. longi. Flores ¾ poll. diam.

The elongate leaves, with their small spur-like auricles at the base, at once distinguish this from all previously described species (N. E. Brown).

JANUSIA GUARANITICA, Juss.

Hab.—Rio Paraná and Paraguay.

OXALIS CHRYSANTHA, Prog.

Hab.—Rio Pilcomayo. Common in open woodlands and in the open campo. Fl. Dec.

AGONANDRA EXCELSA, Griseb.

Hab.—Margin of monte, Fortin Page.

MAYTENUS VITIS-IDÆA, Griseb.

Hab.—In the little patches of monte. Fl. 22nd Sept.

Prov. Arg., *Cápia*.

A shrub ranging to about 10 feet in height, with densely aggregated foilage of thick, fleshy leaves, which are twisted upon their petioles, so as to lie in radial longitudinal planes with regard to the shoot.

CARDIOSPERMUM HALICACABUM, L.

Hab.—Fortin Page. River banks and open places in woods. Fl. May, June. Fruit Aug., Sept.

A creeper with palmipartite leaves and peculiar capsular fruits.

PAULLINIA ANGUSTA, N. E. Br. (n. sp.).—*P. pinnatæ* similis, sed foliolis multo angustioribus 1½–4 poll. longis, ½–1 poll. latis, elongato-oblongis, subacutis, basi plus minusve cuneatis, utrinque grosse et obtuse 3–7 dentatis;

floribus magis pubescentibus, fructibus fusiformibus acutis, nec clavatis et obtusis vel retusis apiculatis, differt.

Hab.—Paraguay; Villa Occidental, Balansa, 2479! Stewart! Rio Pilcomayo, Kerr! Porto Pachico, Moore, 1063!

This is somewhat like *P. pinnata*, but the leaflets are narrower and longer and the fruit is smaller and almost equally narrowed to both ends (N. E. Brown).

PAULLINIA sp.? A small specimen, too imperfect for description.

DIPLOKELEBA, N. E. Br. (gen. nov. Sapindacearum).—Flores unisexuales. Sepala inæqualia biseriata, late imbricata. Petala 5, æqualia, imbricata, obovata, esquamata. Discus duplex, completus, bicupularis, obsolete crenulatus, interiore intus 8-sulcato. Stamina 8, intra discum regulariter inserta, filamentis filiformibus elongatis exsertis glabris; antheræ parvæ versatiles. Ovarium in fl. ♂ rudimentarium subglobosum. Flores ♀ fructusque non vidi.—Arbor vel arbuscula. Folia alterna exstipulata, imparipinnata, foliolis oppositis vel alternis integris, foliolo terminali ad rudimentum filiformem reducto. Paniculæ terminales.

D. FLORIBUNDA, N. E. Br.—Ramulis, petiolis, pedunculis, pedicellisque puberulis; foliolis 6–8 longe petiolulatis, oblongo-lanceolatis acutis, recurvis, glabris; floribus cymoso-vel corymboso-paniculatis; sepalis oblongis obtusis extus intusque pubescentibus; petalis obovatis obtusis, extus intusque pubescentibus, fimbriatulis, albis; disco carnoso aurantiaco; ovarii rudimento pubescenti.

Hab.—Rio Pilcomayo, Kerr, 85!

Sepala $\frac{3}{4}$ – $1\frac{1}{2}$ lin. longa, $\frac{1}{2}$ – $\frac{3}{4}$ lin. lata. Petala $1\frac{1}{2}$ lin. longa, 1 lin. lata.

Until the female flowers and fruit of this plant are known, its position in the order must remain uncertain, but possibly its place should be near *Sapindus*. In the structure of its very remarkable disc it resembles *Lychnodiscus*, Radlk., but that is an African genus and described as having lepidote leaves, funnel-shaped petals, and ten stamens. Mr. Kerr's specimens consist of two small flowering shoots, and bear only male flowers, so that possibly the plant is dioecious (N. E. Brown).

Hab.—Fortin Page.

The specimens on which Mr. Brown has founded this new genus of Sapindaceæ were collected on 19th Dec. 1890, near Fortin Page, in about 24° 50' S. Lat. *D. floribunda* is a slender tree about 20 feet in height, with granular bark, slightly fissured quadroidally. The leaves are pinnate with three or four pairs of oblong-lanceolate leaflets. I only found one specimen in flower, and it possessed only male flowers, so that the species is probably dioecious.

QUEBRACHIA MORONGII, Britton.

Hab.—Rio Pilcomayo, Kerr 55! Fl. 19th Dec.

According to a note accompanying the specimen, this tree is called "Quebracho colorado" by the provincials, that being also the name by which *Q. Lorentzii* is known, and would imply that the wood is of the same hard character as that of the latter species. The genus *Quebrachia*, Griseb., is the same as *Schinopsis*, Engl., but takes precedence over the latter by two years, having been published by Grisebach in 1874 (N. E. Brown).

Under the generic name Quebracho, which is really a corruption of "quebra-hacha" or "break axe," the Argentine provincials recognise three distinct types of trees, the *Quebracho flojo*, *Quebracho blanco*, and *Quebracho colorado*. The last of these is the most important, and is famous for its dense and hard red heartwood, which is one of the most valued timbers of the Argentine—valued especially for its powers of resisting damp. The *Quebracho colorado*, as hitherto known, has been described by Grisebach in his *Plantæ Lorentzianæ* as *Loxopterygium Lorentzii*; and later, he founded for it the new genus *Quebrachia* (Symbol. ad Floram Arg. p. 95). The specimens which I was able to obtain, however, have shown that the *Quebracho colorado* of the Pilcomayo region is a different species of the same genus *Quebrachia*—differing from the *Q. Lorentzii* in its simple instead of pinnate leaves.

CROTALARIA ANAGYROIDES, H. B. K.

Hab.—Rio Pilcomayo.

INDIGOFERA RETRUSA, N. E. Br. (n. sp.).—Rhizomate lignoso, caulibus herbaceis angulato compressis, appresse

cano-pubescentibus; foliis pinnatis, foliolis 3-8, sæpius 5, alternis, lineari-oblongis, subobtusis, mucronulatis, utrinque sparse appresse cano-pubescentibus; stipulis lanceolato-subulatis, liberis; racemis longe pedunculatis, elongatis, multifloris, toto appresse cano-pubescentibus; bracteis parvis caducis, lanceolato-acuminatis; calyce quam corolla duplo brevior, lobis subulatis; vexillo apice pubescente, ovario cano-pubescente, tereto; leguminibus? non vidi.

Hab.—South Brazil, near Porto Alegre, Tweedie, 370! Sandy coast of Rio Grande, near St. Pedras, Tweedie, 311! Rio Pilcomayo, Kerr!

Caules 4-10 poll. longi. Folia $\frac{1}{2}$ -2 $\frac{1}{2}$ poll. longa. Foliolis $\frac{1}{4}$ -1 $\frac{1}{4}$ poll. longis, 1-1 $\frac{1}{2}$ lin. latis. Pedunculi 1-2 $\frac{1}{2}$ poll. longi. Racemi usque ad 4 poll. longi. Flores 4-5 lin. longi.

This plant was confused by Benthams with *I. asperifolia*, Bong., but it is more slender, with more numerous, smaller, and narrower leaflets; the flowers are similar, but the calyx-lobes are rather shorter, and the vexillum more densely canous pubescent. I have not seen the fruit (N. E. Brown).

SESBANIA MARGINATA, Benth.

Hab.—Gran Chaco.

AESCHYNOMENE HISPIDA, Willd.

Hab.—Rio Pilcomayo.

DESMODIUM INCANUM, DC.

Hab.—Rio Pilcomayo.

ERYTHRINA CRUS GALLI, L.

Hab.—Rio Paraguay.

VIGNA LUTEOLA, Benth.

Hab.—Rio Pilcomayo.

CAESALPINIA MELANOCARPA, Griseb.

Hab.—Frequent in the "monte duro" on the Pilcomayo. Fl. 11th Nov. Fruit 11th Dec.

Prov. Arg., Guayacan.

A large stout tree, bark green and smooth, delicate feathery foliage.

PARKINSONIA ACULEATA, L.

Hab.—Frequent on bank of Rio Pilcomayo above “Las Juntas.”

CASSIA BICAPSULARIS, L.

Hab.—Common all along the lower Pilcomayo in open scrubby places.

A small shrub with spreading woody stems. The fruit consists of an elongated pod, and each seed is contained in a separate chamber. The seeds are albuminous, and the embryo is very rich in chlorophyll, which is probably to be correlated with the translucence of the surrounding tissue.

CASSIA LÆVIGATA, Willd.

Hab.—Rio Paraguay and Rio Pilcomayo.

CASSIA OCCIDENTALIS, L.

Hab.—Rio Paraguay and Rio Pilcomayo.

PIPTADENIA QUADRIFOLIA, N. E. Br. (n. sp.).—Arbor inermis, foliis parvis, pinnis unijugis; foliolis unijugis, oblique obovatis, obtusissimis, supra glabris, subtus pilis minutis paucis; petiolis petiolulisque puberulis, ad apices glandula parva instructis; spicis axillaribus, simplicibus, cylindraceis, breviter pedunculatis; pedunculis, calycibus, corollisque omnibus puberulis; calyce quam corolla triplo brevior, quinquedentato; petalis oblongis obtusis; staminibus exsertis, quam corolla subduplo longioribus; ovario stipitato, dense et appresse cano-tomentoso; legumine plano, scaberulo, fuliginoso; seminibus complanatis, pallidis.

Hab.—Rio Pilcomayo, Kerr, 1!

Folia 1 poll. longa. Petiolis $\frac{1}{4}$ poll. longis. Jugæ petiolis 2 lin. longis. Petiolulis $\frac{1}{2}$ – $\frac{3}{4}$ lin. longis. Foliolis 4–7 lin. longis, 3–5 lin. latis. Spicæ 1–2 $\frac{1}{4}$ poll. longa. Calyx $\frac{1}{2}$ lin. longus. Corolla 1 $\frac{1}{4}$ lin. longa. Stamina 2 lin. longa. Legumen 1 $\frac{1}{2}$ –2 poll. longa, $\frac{1}{2}$ poll. lata. Semina 2 $\frac{1}{2}$ lin. diam.

Nearly allied to *P. fatida*, Benth., but the leaves seem always to be 1-jugate; the leaflets are broader in proportion to their length, more obovate and more obtuse than in

P. fetida; the spikes are longer and solitary; and the stamens are twice as long as the corolla, whilst in *P. foetida* they are only shortly exerted (N. E. Brown).

Toba, *Chigeráik*.

A small tree abundant in the isolated patches of monte around Fortin Page. Leaves began to appear 12th Aug., flowers 30th Aug.; and by 2nd Sept. in full flower. Completely deciduous.

The fruit consists of curved legumes, $1\frac{1}{2}$ –2 inches in length, and when mature, of a dark brown colour and very hard, and with a rough outer surface. The seeds are white, also extremely hard, and supported upon an elongated flexible funicle. The brilliant colour of the seeds and the rattling sound that is constantly produced by the slightest wind, owing to the flexible funicle, makes the fruit exceedingly conspicuous and *apparently* beautifully designed for the attraction of birds.

I, however, quite failed to find that anything of this kind actually did take place. On the contrary, the tree appeared to be scouted by animals, the leaves having a very disagreeable alliaceous odour. I examined the stomachs of many hundred birds in the region where the tree grows, and not in a single case did I discover any of its seeds among their contents.

PROSOPIS JULIFLORA, DC., var.

Prov. Arg., *Algarobo*; Toba, *Kamúp*.

This *Algarobo* is fairly common about Fortin Page, growing singly in the drier parts of the campo. In general appearance and in habit, it resembles the *Vinal*, but it is a smaller tree, and its spines are not of the extraordinary size so characteristic of the *Vinal*.

The *Algarobo* furnishes in its dark red heartwood a strong and useful timber, while, growing as it does in the open campo, its broad and leafy head affords a refreshing shade from the rays of the noon-day sun. It is, however, for its fruit that it is especially noted, and from which it gets its name of *Algarobo*, the Carob or Locust tree. These fruits are long, curved pods about 8 inches in length by $\frac{3}{4}$ inch in breadth, whose soft and spongy tissue contains very large quantities of grape sugar and of starch,

from 25–35 per cent. of the former, and from 11 to 16 per cent. of the latter. It is almost unnecessary to say that hidden in so attractive an envelope as this, the seeds are encased in hard woody sheaths well calculated to carry them safely through the digestive canal of herbivorous animals.

During the *Algarobo* season, *i.e.*, during December and January, these pods form a very important factor in the food supply of the Toba and other Indians of the Gran Chaco. The women go out during the day to collect the fallen ripe pods from under the *Algarobo* trees. The pods are pounded up in a kind of rude mortar made from the upright base of a dead palm stem, and on separating out the hard seeds a kind of meal is obtained, which forms a very nourishing and staying article of food—*Patai*, while stirred up in water it affords a most refreshing drink. The Tobas, however, take further advantage of the large quantity of grape sugar present. The pods are roughly pounded and steeped in a considerable quantity of water in large calabashes, and left to stand overnight (or in the cold weather, for a couple of nights). Brisk fermentation ensues, and the result is a comparatively mild but at the same time very insidious alcoholic beverage, colourless and with a sourish taste, known to the Tobas as *Luktagdá*—to the Provincial Argentines as *Aloja*.

PROSOPIS RUSCIFOLIA, Griseb.

Hab.—Rio Pilcomayo.

Prov. Arg., *Vinal*; Toba, *Nedastk*.

The *Vinal* is one of the more conspicuous trees of the Chaco, conspicuous alike from its large size, and from its habit of growing alone and solitary in the open palmar. A large specimen measured 50 feet in height by 10 feet in girth at 4 feet from the ground. In general aspect the *Vinal* is much branched, wide-spreading, gnarled, and knotty. Its rough bark is deeply furrowed vertically; its heartwood hard and reddish.

On the Chaco frontiers the fruit of the *Vinal* is much used for feeding cattle, while a decoction of its leaves is of high repute as a remedy for ophthalmia. An Argentine chemist has found that the leaves contain a special

alkaloid, which he has named *Vinalin*. The most interesting feature of the *Vinal*, however, is its spines. Other species of the genus *Prosopis* are commonly provided with spines, but in *Prosopis ruscifolia* these attain to gigantic dimensions, so that a tiny twig an eighth of an inch thick may bear spines half-an-inch thick at the thickest point, and 5 inches in length. These spines would form an interesting problem to those who hold the opinion that spines are merely starved branches, and that they mark loss of vegetative power, for here we have the spines enormously larger than the parent branch from which they are given forth.

The presence and the use of these enormous spines is, however, in any case very puzzling. The ordinary function of spines is as a protection against herbivorous animals, but the *Vinal* is a large tree, and there are no large indigenous herbivora, except deer and tapirs, both of which are obviously unable to prey upon the foliage. It seems to me most reasonable to look upon the *Vinal* as a survival of what was fittest a long period of time since, when, as in tertiary and post-tertiary times, the region which it inhabits had a population of large herbivorous mammals.

DESMANTHUS VIRGATUS, Willd.

Hab.—Fortin Page. In the open palmar; growing a few plants together, often on termite hills.

MIMOSA ASPERATA, L.

Hab.—Rio Paraná near Goya. Fl. Jan.

MIMOSA CINEREA, Vell.

Hab.—Open palmar near Fortin Page.

MIMOSA STRIGILLOSA, Torr. et Gr.

Hab.—Fortin Page. Common in the open palmar, resembling clover in its general habit. Fl. 20th Oct.

MIMOSA sp. ? — Specimen too imperfect for determination.

ACACIA BONARIENSIS, Gill.

Hab.—Lower Pilcomayo, by the river margin.

ACACIA FARNESIANA, Willd.

An exceedingly common shrub, amongst the brush by the river bank. The flower balls, which are of a deep yellow, last only a very few days. In flower 15th–25th July. The Argentines of our expedition called this plant *Espinillo*, a name common, however, to almost all shrubby acacias. This was the first of the acacias to flower. The flowers are most beautifully perfumed.

ACACIA PRAECOX, Griseb.

A low tree 10–15 feet in height, frequent in the montecitos around Fortin Page.

A well-marked variety of this species seems to be becoming developed, characterised by its very straggling, almost climbing habit, and the (no doubt correlated with this) more numerous and more recurved spines.

The trees burst into a mass of bloom about 12th Aug., continuing in flower until about the end of the month. Each tree in flower exhaled a most delightful perfume, which could be perceived a long distance off, and proved a great attraction to insects and humming birds. The flowers were produced before the foliage. Fruit 1st Dec.

PITHECOLOBIUM MULTIFLORUM, Benth.

Prov. Arg., *Timbo blanco*.

A tall, slender tree, exceedingly abundant along the river banks in low-lying situations in the Chaco. Trees of this species lost their leaves entirely during the winter. The new leaves burst forth about the 1st Aug., but many of the trees were again stripped of foliage by the frosty night, about 6th Aug. A large specimen had a circumference of 7 feet, at 4 feet from ground.

The heartwood is white and very brittle—quite useless as a timber. The tree is much affected by two species of *Loranthaceæ*.

Fl. 27th Sept.–Oct.

EUGENIA GLAUDESCENS, Camb.

Hab.—Montes on Rio Pilcomayo.

TIBOUCHINA, cfr. T. SEBASTIANOPOLITANA, Cogn.?

Hab.—Rio Pilcomayo.

NESÆA SALICIFOLIA, H. B. K.

Hab.—Rio Pilcomayo in campo, by margin of monte.

JUSSIÆA BRACHYCARPA, Micheli.

Hab.—Rio Pilcomayo.

BANARA TOMENTOSA, Clos.

Hab.—Rio Pilcomayo.

TURNERA ULMIFOLIA, L. var.

Hab.—Rio Pilcomayo.

PASSIFLORA GIBERTI, N. E. Br. (n. sp.).—Caule scandente tereti glabra; foliis profunde trilobis, basi late rotundatis vel sub-cordatis lobis oblongo-lanceolatis, subacutis, basi pauce serratis, utrinque glabris; petiolis 2–6 glandulosis, pedunculis quam petioli longioribus; stipulis foliaceis, falcato-lanceolatis vel falcato-ovatis, acutis, mucronatis; bracteis liberis, ovatis acutis, mucronatis, basi serratis; calycis tubo brevissimo, basi intruso, sepalis oblongis obtusis, dorso sub apice processu perlongo acuto munitis; petalis oblongis obtusis, coronæ faucialis filamentis subquinqseriesiatis, extimis radiatis quam petala $\frac{1}{2}$ brevioribus, intimis erectis circum gynophorum conniventibus eoque paullo brevioribus, intermediis multo brevioribus; corona media e medio tubi enata, membranacea, deflexa, integra; corona basilari membranacea, cupuliformi, integra; filamentis complanatis, antheris magnis; ovario ellipsoideo, glabro, stigmatibus crassis clavatis.

Hab.—Argentine Republic, Gran Chaco, Gibert 43! Kerr! Paraguay, Balansa, 2202!

Folii lamina 2–2 $\frac{1}{2}$ poll. longa, 2 $\frac{1}{2}$ –3 poll. lata. Petiolus $\frac{1}{2}$ –1 poll. longus. Pedunculi 1–2 poll. longi. Bractææ $\frac{1}{2}$ –1 poll. longæ, $\frac{1}{3}$ – $\frac{1}{2}$ poll. latæ. Flores 3 poll. diam. Cornua sepalorum $\frac{1}{2}$ – $\frac{3}{4}$ poll. longa. Gynophorum $\frac{1}{2}$ – $\frac{3}{4}$ poll. longum.

This species seems nearly related to *P. Sprucei*, Mart., and *P. violacea*, Vell.; from both it differs in the much longer outer filaments of the corona, and from the latter in its glabrous ovary; from the plant figured as *P. violacea*, in Flora Brasiliensis, vol. xiii., pt. 1, t. 123 (which does not agree with the description given on p. 612 as to the corona), and from that figured in the Botanical Magazine,

t. 6997, as *P. violacea*, it differs in the structure of its corona, and in having the dorsal horns of the sepals placed at about $\frac{1}{4}$ – $\frac{3}{8}$ of an inch below the apex of the sepals. The plant figured in the Flora Brasiliensis as *P. violacea*, may be the same as that of the Botanical Magazine, only with the corona erroneously represented, but they are both distinct from the true *P. violacea* of Vellozo, which appears to me to be much more like *P. Sprucei*, than to either of these plants. The petals and interior of the sepals of *P. Giberti* are stated by Balansa to be yellowish, which accords with their appearance in the dried state; the outer coronal filaments appear to be purple or violet with a white base, and have some appearance of being banded, the inner filaments are paler, but this may be due to the process of drying (N. E. Brown).

PASSIFLORA MAXIMILIANA, Bor.

Hab.—Rio Pilcomayo.

CAYAPONA FICIFOLIA, Cogn.

Hab.—Rio Pilcomayo.

BEGONIA CUCULLATA, Kl.

Hab.—Damp spots in forests of Lower Pilcomayo. Fl. Mar., April. Flowers white.

SESUVIUM PORTULACASTRUM, L.

Hab.—Fortin Page. Abundant by margins of salt pools, and by margin of river. Always in very salt soil. Fl. Aug., Sept., Oct.

HYDROCOTYLE LEUCOCEPHALA, Ch. et Sch.

Hab.—Rio Pilcomayo.

HYDROCOTYLE RANUNCULOIDES, Linn. fil.

Hab.—In fresh-water marshes along with *Enhydra*. Fl. October.

ERYNGIUM CORONATUM, Hook et Arn.

Hab.—Open campo, Rio Pilcomayo.

Toba, *Algwö*.

ERYNGIUM ELEGANS, Ch. et Sch.

Hab.—Estancia Gil. Rio Pilcomayo. Abundant in open campo on Lower Pilcomayo.

SPERMACOCE DIFFUSA, Pohl.

Hab.—Rio Pilcomayo.

SPERMACOCE VERTICILLATA, L.

Hab.—Fortin Page. Abundant in shady spots. Fl. 8th October.

GUETTARDA URUGUENSIS, Ch. et Sch.

Hab.—Gran Chaco.

MACHAONIA ACUMINATA, H. et B.

Hab.—Monte near Fortin Page.

MACHAONIA BRASILIENSIS, Ch. et Sch.

Hab.—In the monte near Fortin Page.

PSYCHOTRIA ALBA, Ruiz et Pav.

Hab.—Rio Pilcomayo.

VERNONIA RUBRICAULIS, H. B. K.

Hab.—Rio Pilcomayo.

STEVIA MULTIARISTATA, Spr.

Hab.—Rio Pilcomayo.

EUPATORIUM CANDOLLEANUM, Hook. et Arn.

Hab.—Gran Chaco.

EUPATORIUM HECATANTHUM, Baker.

Hab.—Rio Pilcomayo. Abundant all along the river's banks. Fl. 15th Sept.

SOLIDAGO MICROGLOSSA, DC.

Hab.—Rio Pilcomayo.

VITTADINIA MULTIFIDA, Griseb.

Hab.—Rio Pilcomayo.

BACCHARIS DRACUNCULIFOLIA, DC.

Hab.—Rio Pilcomayo.

BACCHARIS SERRULATA, Pers.

Hab.—Banks of Lower Pilcomayo.

TESSARIA ABSINTHOIDES, DC.

A small tree like a miniature Lombardy poplar in habit, 15–20 ft. in height. Forms a dense growth on the low-lying islands of the Paraná, especially about Goya, and north of this. Also on banks of Bermejo near its mouth. Occasional thickets on the Pilcomayo, more especially on the southern branch.

Argentine provincial name *Palo bobo*.

ENHYDRA MARITIMA, DC.

A succulent plant whose stems creep over the surface of mud or shallow water, in fresh-water marshes.

Fl. 9th Oct., near Fortin Page.

ECLIPTA ERECTA, L.

Hab.—Rio Pilcomayo.

WEDELIA KERRII, N. E. Br. (n. sp.).—Caule herbaceo, erecto; dichotomo vel trichotomo, hispidus; foliis breviter petiolatis, ovatis, obtusis vel subacutis, basi in petiolo angustatis, obtuse serratis, utrinque subhispidis; pedunculis e dichotomiis solitariis, et apice ramorum subcorymbosis, monocephalis, hispidis; involucri squamis biseriatis, lanceolatis, subobtusis, hispidis; paleis lineari-lanceolatis concavis, subacutis, ciliatis, apice luteis; ligulis late oblongis, tridentatis, luteis; pappi squamulis paucis, minutis, caducis, achæniis calvis, compresso-tetragonis, obpyramidalis, apice truncatis cum tubercula centrali, lateris scrobiculatis.

Hab.—Rio Pilcomayo, Kerr!

Folia $1\frac{1}{2}$ – $2\frac{1}{2}$ poll. longa, $\frac{1}{3}$ – $1\frac{1}{4}$ poll. lata. Pedunculi 1–3 poll. longi. Capitula $\frac{1}{2}$ poll. diam. Achænia $1\frac{1}{2}$ lin. longa, 1 lin. lata (N. E. Brown).

WEDELIA PILOSA, Baker (*W. brachycarpa*, Baker).

Hab.—Rio Pilcomayo.

WEDELIA SUBVAGINATA, N. E. Br. (n. sp.).—Caule erecto, subglabro vel sparse et minute appresse strigoso, foliis oppositis, lanceolatis, subacutis, mucronatis, basi acutis, pauce et minute denticulatis, trinerviis, subrigidis, supra subtusque appresse strigosis, breviter petiolatis, petiolis basi in vaginam brevissime connatis; pedunculo solitario, elongato, appresse strigoso; involucri squamis biseriatis,

linearibus vel lanceolato-linearibus, obtusis, crassis, minute appresse strigosis, ligulis lineari-oblongis profunde bilobis vel interdum bifidis, lobis oblongis obtusis, luteis; paleis lanceolatis acutis, concavis, apice scabris; pappo coroniformi irregulariter lacerato; achæniis?

Hab.—Rio Pilcomayo, Kerr.

Folia 2–2½ poll. longa, 5–7 lin. lata. Pedunculus 3½ poll. longus. Capitulum 1½ poll. diam. (N. E. Brown).

ASPILIA BUPHTHALMIFLORA, Griseb.

Hab.—Fortin Page. Abundant in many spots in open palmar. Fl. 15th Oct.

POROPHYLLUM ELLIPTICUM, Cass.

Hab.—Gran Chaco, Rio Pilcomayo.

GAILLARDIA DONIANA, Griseb.

Hab.—Gran Chaco, Rio Pilcomayo.

TRIXIS OCHROLEUCA, Hook. et Arn.

Hab.—Common along river banks, Fortin Page. Fl. Sept., Oct. Flowers white.

PICROSIA LONGIFOLIA, Don.

Hab.—Rio Pilcomayo.

MENODORA INTEGRIFOLIA, Steud.

Hab.—Colonia Hernandá, Rio Paraná.

THEVETIA BICORNUTA, Müll., Arg. (*T. paraguayensis*, Britton).

Hab.—Common in open campo around Fortin Page. Fl. Nov., Dec.

ARAUJA MEGAPOTAMICA, Don.

Hab.—Lower Pilcomayo.

ASCLEPIAS MELLIODORA, St. Hil.

Hab.—Fortin Page. The open campo. Fl. 1st Oct.—30th Nov. In fruit 24th Dec.

CORDIA CYLINDROSTACHYA, Rœm. et Schultes.

Hab.—Rio Pilcomayo.

IPOMŒA ARGENTINA, N. E. Br. (n. sp.).—Caule prostrato vel volubile cum foliis pedunculis sepalisque appresse

pubescentibus vel glabrescentibus, foliis breviter petiolatis, anguste lanceolatis, oblongo-lanceolatis vel oblongis, obtusis vel acutis, mucronulatis, basi subacutis vel subobtusis, pedunculis quam foliis brevioribus, 1–3 floris; bracteis parvis, lanceolatis acuminatis; pedicellis calyce brevioribus; sepalis late ovatis vel ovato-lanceolatis, acutis vel subobtusis, basi late rotundatis haud decurrentibus; corolla magna, infundibuliforme, extus vittis quinque appresse pubescentibus; staminibus styloque corolla duplo brevioribus, filamentis glabris basi barbatis, ovario glabro, stigma didyma, lobis globosis.—*Aniseia cernua*, var. *ambigua*, Meissn. in Flora Brasiliensis, vol. vii., p. 319.

Hab.—Buenos Ayres, Tweedie! Uruguay, Tweedie! Lorentz, 65! and 926! Rio Grande, Tweedie! Rio Pilcomayo, Kerr, 63!

Foliorum petioli 2–5 lin. longi; laminæ $1\frac{1}{4}$ –3 poll. longæ, $2\frac{1}{2}$ –10 lin. latæ. Pedunculi $\frac{1}{2}$ – $2\frac{1}{2}$ poll. longi. Pedicelli 2–8 lin. longi. Sepala 6–8 lin. longa, $3\frac{1}{2}$ –5 lin. lata. Corolla $1\frac{1}{2}$ – $1\frac{3}{4}$ poll. longa, et subæquilata.

This species is nearly related to *I. martinicensis*, Mey., but it is at once distinguished by its very much larger flowers, and by the sepals not being decurrent at the base. It also appears to be allied to *I. campestris*, Meissn., *I. prostrata*, Meissn., and *I. Selloi*, Meissn. In the Flora Brasiliensis, Meissner placed it as a variety of *Aniseia cernua*, Mor., which is a very different plant, with flowers that are not one quarter the size of those of the present species; the figure, too, of *Aniseia cernua* given in the Flora Brasiliensis, is totally different from the true plant of Moricand, and probably represents *Aniseia nitens*, Chois (N. E. Brown).

A common ground creeper in shady spots. Fl. 1st Nov.

IPOMŒA NUDA, N. E. Br. (n. sp.).—Caule volubili, glabro; foliis longe petiolatis, late cordatis acutis vel subtrilobcordatis, lobo antico triangulari-acuminato, lobis vel auriculis posticis obtusissime rotundatis, utrinque glabris; pedunculis axillaribus quam foliis brevioribus, trichotomis vel dichotomis, laxe cymoso 5–9 floris, glabris; pedicellis calyce triplo longioribus, glabris; sepalis coriaceis, ellipticis obtusis, minute apiculatis, glabris, exterioribus sub-

brevioribus; corolla infundibuliformi, glabra; capsula globosa, glabra, calycem dimidio superante; seminibus (immaturo) glabris.

Hab.—Rio Pilcomayo, Kerr, 12!

Petioli $\frac{3}{4}$ – $2\frac{1}{2}$ poll. longi. Lamina $\frac{3}{4}$ –2 poll. longa $\frac{3}{4}$ –2 poll. lata. Pedunculi $\frac{3}{4}$ –2 poll. longi. Pedicelli $\frac{1}{2}$ – $\frac{3}{4}$ poll. longi. Sepala exteriora 2 lin. longa, interiora $2\frac{1}{2}$ lin. longa, 2 lin. lata. Corolla 9–10 lin. longa.

Allied to *I. umbellata*, Meyer, but the cymes have fewer flowers, the calyx is smaller, and the leaves are different in form.

The collection contains another species of *Ipomoea* allied to this one, but with larger flowers and differently shaped leaves. The material, however, is insufficient for a description (N. E. Brown).

IPOMOEA VILICALYX, N. E. Br. (n. sp.).—Caule volubili, cum petiolis pedunculisque dense villosa-tomentoso; foliis cordatis, apice acuminatis, acutis vel obtusis, mucronulatis, utrinque molliter adpressequa tomentosis vel subvillosis; pedunculis quam petiolis longioribus, dichotomis, cymoso 3–9 floris; pedicellis calyce æquantibus, villosis; sepalis oblongis obtusis, subcoriaceis, pilis longis dense villosis; corolla infundibuliformi roseo-purpurea, extus adpressequa villosa; staminibus inclusis, filamentis basi dense barbatis; ovario glabro.

Hab.—Argentine Republic, Gran Chaco, Gibert, 67! Rio Pilcomayo, Kerr!

Petioli $\frac{1}{2}$ – $1\frac{1}{4}$ poll. longi. Folia $1\frac{1}{2}$ –4 poll. longa, $1\frac{1}{4}$ – $2\frac{3}{4}$ poll. lata. Pedunculi $1\frac{1}{2}$ –2 poll. longi. Pedicelli 4–6 lin. longi. Sepala 5 lin. longa, $2\frac{1}{2}$ –3 lin. lata. Corolla $1\frac{3}{4}$ poll. longa, circa 2 poll. diam.

A very distinct species, easily recognised by its tomentose surface and shaggy calyx; the branches of the cyme are very short, being only from 1–3 lines long (N. E. Brown).

IPOMOEA PLATENSIS, Ker.

Hab.—Rio Pilcomayo.

IPOMOEA TUBERCULATA, Roem. et Schultes.

Hab.—Rios Paraná, Paraguay, and Pilcomayo.

JACQUEMONTIA ALBA, N. E. Br. (n. sp.).—Caule volubili cum foliis, pedunculis, bracteis, pedicellisque tomentoso; foliis breviter petiolatis ovatis vel cordato-ovatis acutis, aristato-mucronatis, marginibus leviter sinuatis; pedunculis quam foliis longioribus, umbellatim vel breviter cymoso 3-11-floris; sepalis oblongis obtusis mucronulatis, pedicello subæquantibus vel subbrevioribus, parce pubescentibus vel subglabrescentibus, ciliatis; corolla infundibulariformi, alba, extus glabra; capsula globosa, glabra, sepalis æquante; semina glabra.

Hab.—Paraguay, Balansa, 1065! Rio Pilcomayo, Kerr! Brazil, Pohl, 1756!

Foliorum petioli 2-6 lin. longi, laminæ 1-2½ poll. longæ, ¾-1½ poll. latæ. Pedunculi ¾-3½ poll. longi. Pedicelli 2-4 lin. longi. Sepala 2-2½ lin. longa, 1 lin. lata. Corolla ¾ poll. longa. Capsula 2 lin. diam. (N. E. Brown).

JACQUEMONTIA TAMNIFOLIA, Griseb.

Hab.—Rio Pilcomayo. Open palmar. Common.

CONVOLVULUS HERMANNIÆ, L'Herit.

Hab.—Rio Pilcomayo.

SOLANUM MULTISPINUM, N. E. Br. (n. sp.).—Caule, petiolis, pedunculis, pedicellis, calycibusque omnibus dense aculeatis, stellato-tomentosis cum glandulis stipitatis intermixtis; aculeis acerosis, rectis, fulvis, patentissimis; foliis solitariis elongato-ovatis, subobtusis, basi cordatis, breviter sinuato-lobatis, utrinque dense stellato-tomentosis et ad venas aculeis armatis, supra tomento flavescente, subtus pallidiora; pedunculis lateralibus quam petiolis brevioribus, scorpioides, laxe plurifloris; pedicellis erectis, longis, tenuibus; calyce campanulato ½ vel ¾ corollæ æquante, ad dimidium quinquelobato, dense stellato-tomentoso et aculeato, lobis anguste lanceolatis acuminatis, corolla ad medium vel ultra quinquéfida, extus stellato-tomentosa, lobis lanceolatis acutis, recurvo-patentibus; antheris lanceolatis, poris apicalibus dehiscentibus.

Hab.—Rio Pilcomayo, Kerr!

Foliorum petioli ¾-1½ poll. longi, laminæ 2½-3 poll. longæ, 1½-1¾ poll. latæ. Pedunculi ½ poll. longi (vel ultra?). Pedicelli ¾-1 poll. longi. Calyx 4½ lin. longi

(lobis $2\frac{1}{2}$ lin. longis). Corolla 1 poll. diam. (lobis $3-3\frac{1}{2}$ lin. longis, 2 lin. latis). Antheræ $3\frac{1}{2}-4$ lin. longæ. Aculei $1\frac{1}{4}-2$ lin. longi.

This species should probably be placed near *S. crinitipes*, it seems to be well distinguished by its long pedicels, deeply divided calyx, and the horizontal needle-like spines with which the calyx, pedicels, petioles and stem, are thickly clothed. A plant collected in Paraguay by Balansa (No. 2115) may be a form of this species, but the specimen I have seen is in fruit only, and the leaves have much shorter petioles, are more elongated, more deeply lobed, and have fewer veins (N. E. Brown).

SOLANUM ROBUSTUM, Wendl.

Hab.—Lower Pilcomayo. Fl. March.

SOLANUM SISYMBRIFOLIUM, Lamk.

Hab.—Gran Chaco.

PHYSALIS ANGULATA, L.

Hab.—Rio Pilcomayo.

JABOROSA INTEGRIFOLIA, Lamk.

Hab.—Common in open campo near Fortin Page.

PETUNIA VIOLACEA, Lindl.

Hab.—Rio Pilcomayo.

NICOTIANA GLAUCA, Grah.

Hab.—By margin of river, Rio Pilcomayo.

STEMODIA PALUSTRIS, St. Hil.

Hab.—Rio Pilcomayo.

SCOPARIA FLAVA, Cham.

Hab.—Frequent in open palmar near Fortin Page. Fl. Nov., Dec.

BUCHNERA ELONGATA, Sw.?

Hab.—Rio Pilcomayo.

BIGNONIA CORYMBIFERA, Vahl.

Hab.—Montes of Rio Pilcomayo.

DOLICHANDRA CYNANCHOIDES, Cham.

Hab.—Rio Pilcomayo. Lat. $24^{\circ} 48' S.$ In margin of "monte duro." Straggling shrub. Fl. 3rd Dec. 1890.

PITHECOCTENIUM CYNANCHOIDES, Cham.

Hab.—Rio Paraná, near Goya. Gran Chaco.

RUELLIA TWEEDIANA, Griseb.

Hab.—Gran Chaco.

CHÆTOTHYLAX UMBROSUS, Nees.

Hab.—In the montes, Rio Pilcomayo.

BELOPERONE AMHERSTIÆ, Nees.

Hab.—In the montes near Fortin Page.

BELOPERONE KERRII, N. E. Br. (n. sp.).—Glabra corolla excepta; caule tereto; foliis petiolatis, lanceolatis vel ovatis, obtusis vel acutis, basi rotundatis vel acutis; spica terminali composita, anguste thyrsoidea, basi bifoliata; bracteis bracteolisque anguste spathulatis calycem æquantibus; calycis segmentis lanceolatis acuminatis angustissime albo-marginatis; corolla quam calyce triplo vel quadruplo longiora punicea, lobis extus minute pubescentibus, labio superiori recto, anguste oblongo-lanceolato, apice bifido, inferiori triplo latiori usque ad medium trifido, lobis oblongis obtusis; staminibus corolla brevioribus; antherarum loculi unus super altero positi, inferiori breviter calcarati.

Hab.—Rio Pilcomayo, Kerr, 108!

Foliorum petioli 2–4 lin. longi, laminæ 1–2 poll. longæ, $\frac{1}{4}$ – $\frac{3}{4}$ poll. latæ. Spica 1–1 $\frac{1}{2}$ poll. longa. Bracteæ et calyx 4 lin. longæ. Corolla 1 $\frac{1}{4}$ poll. longa.

Of the described species this appears to be nearest allied to *B. plumbaginifolia*, but has a much narrower inflorescence and smaller leaves (N. E. Brown).

Common in open spots in monte.

DICLIPTERA POHLIANA, Nees.

Hab.—Rio Pilcomayo.

LANTANA SELLOWIANA, Link et Otto.

Hab.—Rios Paraná and Pilcomayo.

LIPPIA CANESCENS, Kunth.

Hab.—Rio Pilcomayo.

LIPPIA LYCIOIDES, Steud.

Hab.—Rios Paraná, Paraguay, and Pilcomayo.

VERBENA CHAMÆDRYFOLIA, Juss.

Hab.—Frequent in open campo along Rios Paraná, Paraguay, and Pilcomayo. Fl. Aug., Sept., Oct.

VERBENA ERINOIDES, Lam. ?

Hab.—Fortin Page. Very common in open campo. White-flowered individuals occasionally seen. Fl. Aug., Sept., Oct.

This is the commonest Verbena on the Pilcomayo.

VERBENA LITTORALIS, H. B. K.

Hab.—Open campo, Rio Pilcomayo.

VERBENA STELLARIOIDES, Cham.

Hab.—Fortin Page. Frequent in open palmar. Fl. Aug., Sept., Oct.

HYPTIS LAPPACEA, Benth.

Hab.—Rio Pilcomayo.

PFAFFIA TENUIS, N. E. Br. (n. sp.).—Caulibus tenuibus, simplicibus vel apice trichotomis, albo-lanatis; foliis sessilibus, lanceolatis, acutis, supra arachnoideis, subtus dense albo-lanatis; pedunculo elongato, terminali, gracili, simplici; capitulo parvo, globoso vel oblongo, rachi lanata; bracteis ovatis cuspidato-acuminatis, stramineis, dorso glabris, apice ciliatis; bracteolis lateralibus late ellipticis, obtusis, glabris, albidis; perianthii segmentis lanceolato-oblongis, obtusis, albidis, basi longe villosis, apice pubescentibus; tubo stamineo parte filamentorum libera basi ciliata subæquante; filamentorum lobis lateralibus medio antherifero multo longioribus, integris, non ciliatis; ovario ovato, stigma subsessile, obsolete bilobo.

Hab.—Uruguay, Lorentz, 998! Rio Pilcomayo, Kerr!

Herba 6–9 poll. alta. Folia $\frac{3}{4}$ –1 $\frac{1}{4}$ poll. longa, 2–5 lin. lata. Pedunculi 2 $\frac{1}{2}$ –4 poll. longi. Capitula 3–3 $\frac{1}{2}$ lin. diam. Bracteæ 1 lin. longæ. Bracteolæ laterales 1 $\frac{1}{3}$ lin. longæ. Flores 1 $\frac{3}{4}$ lin. longi.

Very similar to *P. gnaphalioides*, Mart., in appearance, but is easily recognised by the much smaller flower-heads (N. E. Brown).

SALICORNIA PERUVIANA, Kunth.

Hab.—Fortin Page. Abundant upon bare soil by the margins of river and of salt lagunas. Found only on soil saturated with salt. Fl. Sept., Oct.

RIVINA LAEVIS, L.

Hab.—Rio Pilcomayo, Fortin Page.

POLYGONUM ACUMINATUM, Kunth.

Hab.—Marshes of Rios Pilcomayo and Paraguay.

MUEHLENBECKIA SAGITTIFOLIA, Meissn.

Hab.—Rio Pilcomayo.

COCCOLOBA ALAGOENSIS, Wedd.

Hab.—Rio Pilcomayo.

COCCOLOBA CORDATA, Cham.

Hab.—In monte near Fortin Page. Fl. 4th Jan.

COCCOLOBA PARAGUARIENSIS, Lindau.

Hab.—A small shrub frequent along margin of the Rio Pilcomayo.

NECTANDRA ANGUSTIFOLIA, Nees., var. *FALCIFOLIA*, Nees.

Hab.—Banks of Lower Pilcomayo.

EUPHORBIA ADENOPTERA, Bertol.

Hab.—Open campo near Fortin Page. Fl. 3rd Nov.

EUPHORBIA BRASILIENSIS, Lamk.

Hab.—Rio Pilcomayo.

EUPHORBIA HYPERICIFOLIA, Linn.

Hab.—Rio Pilcomayo.

EUPHORBIA OVALIFOLIA, Engelm., var. *MONTEVIDENSIS*, Boiss. ?

Hab.—Rio Paraná.

EUPHORBIA SELLOI, Klotzsch.

Hab.—Rio Pilcomayo.

CROTON LOBATUS, L.

Hab.—Rio Pilcomayo, Fortin Page.

CROTON SARCOPETALUS, Müll. Arg.

Hab.—Rio Pilcomayo.

CROTON URUCURANA, Baill.

Hab.—Rio Pilcomayo. A small erect shrub 4 ft. in height. Frequent at margin of monte duro. Fl. 20th Sept.

JULOCROTON ARGENTEUS, Didrichs.

Hab.—Rio Pilcomayo, Fortin Page.

CAPERONIA CASTANÆFOLIA, St. Hil.

Hab.—Banks of Rio Pilcomayo. Lat. 24° 48' S., May 1890.

CAPERONIA CORDATA, St. Hil.

Hab.—Rio Pilcomayo.

ACALYPHA APICALIS, N. E. Br. (n. sp.). — Caulibus herbaceis simplicibus, laxe et breviter pubescentibus; foliis longe petiolatis, membranaceis, basi quinquenerviis, reliqua parte penninerviis, ovato-lanceolatis acuminatis, basi late rotundatis leviterque emarginatis vel subcordatis, subtiliter crenato-dentatis, supra glabris vel minute puberulis, subtus breviter pubescentibus, stipulis subulatis; spicis masculis axillaribus, solitariis, tenuibus, pedunculatis vel subsessilibus densissime florigeris, pubescentibus, infimis basi bractea palmatifida una fœminea rudimentaria præditis; spica androgyna terminali dense florigera, usque ad $\frac{4}{5}$ fœminea, apice mascula, breviter pedunculata, pedunculo pubescente; bracteis fœmineis unifloris, accrescentibus, palmatisectis, segmentis 9–11 linearibus, scabris; calyce fœminea tripartito, segmentis ovatis acutis, pubescentibus; ovario strigoso-hirsuto, stylis multipartitis, lacinulis filiformibus ovario subæquantibus; capsulis non muricatis, seminibus levibus.

Hab.—Rio Pilcomayo, Kerr!

Petiolis $1\frac{1}{2}$ – $2\frac{1}{4}$ poll. longi. Foliorum laminæ 3–4 poll. longæ, 1 – $1\frac{3}{4}$ poll. latæ. Spicæ masculæ 1 – $1\frac{1}{2}$ poll. longæ, 1 – $1\frac{1}{2}$ lin. crassæ, pedunculo 1–3 lin. longo. Spicæ androgynæ pars fœminea $1\frac{1}{2}$ – $1\frac{3}{4}$ poll. longa, mascula 5 lin. longa. Bractæ fructigeræ $1\frac{1}{2}$ lin. longæ. Capsula $1\frac{1}{4}$ lin. diam.

The specimens have no root, but have the appearance of an annual, or the annual stems of a herbaceous perennial. In general appearance this species is something like *A. gracilis*, but the terminal androgynous spike at once distinguishes it from all the other South American species (N. E. Brown).

CELTIS TALA, Gill.

Hab.—Fortin Page. Frequents the edges of the monte.
Fl. 26th Sept.

Prov. Arg. *Tala*.

A straggling shrub some 5 feet in height, characterised by its stiff rectangular spinescent branching. Fruit edible.

QUERCUS sp.

Hab.—Rio Pilcomayo. Frequent in open woodlands.

This is, perhaps, the most interesting plant in the collection from a geographical point of view, but the material is too poor for its determination (N. E. Brown).

BRASSAVOLA PERRINII, Lindl.

Amongst the plants collected at Fortin Page was a fine Epiphytic orchid with white flowers, apparently belonging to *Brassavola*, or some allied genus. Its stems creep along the branches of its host. Its leaves are elongate cylindroidal in form, with a deep groove along the upper surface. Flowers numerous. The three sepals are linear and colourless, as are the two smaller petals. The anterior petal is broad, expanded, and white in colour; basally its edges curl upwards, so as to fit round the edges of the hood-like column, and with it to form a funnel leading into the nectary tube. This latter is about two inches in length, so that probably lepidoptera, and from the white colour of the flowers probably night-flying lepidoptera, make most use of the honey. The upper margin of the mouth of the nectary tube is continued into the hood-like column, whose under surface is deeply concave to form the large somewhat conical stigmatic cavity. The inner surface of this is smeared with sticky cement. Below, this cavity is freely open; while above and distally its roof projects downward somewhat, and ends in several comb-like teeth. As it were, completing the hood distally is a large cushion-like structure, which is loosely held in position in a socket-like cavity by the downwardly projecting teeth before alluded to. This cushion has loosely embedded in it the eight pollinia, and its posterior aspect is smeared with a sticky cement. If a slender object is inserted into the nectary tube and withdrawn, it rubs against the downwardly projecting edge of the cushion, and

rotates it outwards and upwards. Thus loosened from its attachment, it falls down flat upon the proboscis and sticks firmly. With the slightest touch, the protecting cap is knocked off, and we have left, attached to the proboscis, the eight pollinia. On introducing the proboscis into another flower these naturally touch and adhere to the sticky stigmatic surface.

EULOPHIA MACULATA, Rehb. f.

Hab.—Rio Pilcomayo.

ONCIDIUM PUMILUM, Lindl.

Hab.—Rio Pilcomayo.

STENORHYNCHUS ORCHIOIDES, Rich.

Hab.—Rio Pilcomayo.

THALIA GENICULATA, L.

Hab.—Rio Pilcomayo.

CANNA COCCINEA, Ait. ?

Hab.—Rio Pilcomayo.

CANNA GLAUCA, L.

Hab.—Rio Pilcomayo.

BROMELIA ARGENTINA, Baker. (ÜVIRÁ, Kalyité).

This species of Bromelia, with leaves about 5 feet in length, is much used by the Chaco Indians as a source of fibre, of which they make cord and rope, and also coarse cloth. Around Fortin Page it did not occur at all, but existed in considerable quantities about four days' journey to the N.W. The fibre is obtained from the dried and withered leaves by simply peeling off the upper and lower epidermis. The fibre is one of very considerable tenacity, being quite equal or superior to jute, and it is characterised by its high specific gravity, and especially by its wonderful damp-resisting powers.

A note has recently been published upon this species in the "Kew Bulletin," under the name of *Karaguatá*. It, however, ought to be pointed out that *Karaguatá* is a generic name applied in Guarani to almost all large Bromelia-like plants—for instance there is the *Karaguatá guazú* or Great *Karaguatá*, and the *Karaguatá ñ* or Water *Karaguatá*, and many others. To *Bromelia argentina*, however, one scarcely ever hears a Paraguayan apply the

name Karaguatá; it is properly known as *Üvirá*, and this is the name which ought certainly to be used in referring to it, instead of the very vague and indefinite Karaguatá.

BROMELIA ? sp. ?

To the Paraguayans this species is known as *Karaguatá ü*; to the Tobas as *Tuklate*.

The *Karaguatá ü* is an inhabitant of the monte, where it forms a dense undergrowth. The leaves are about 3 feet in length, tapering gradually towards the apex. Margins beset, at regular intervals, with spines acutely bent towards the apex. The upper surface is deeply concave, and leads down into the widely sheathing leaf-base. The fruit is very enticing, of a rich yellow colour, and attractive odour. When first met with I hastened to taste the berries, but though pleasant to taste they are very acrid.

The Tobas pile the spiny Karaguatá plants over the graves of their people.

To the traveller in the Gran Chaco this plant is an inestimable boon, for the dews and rains collect in the deep sheathing axils of its leaves, in which one can thus always find a little fresh water, even when the country all around is baked and parched, and when the rivers are either completely dry or have only a runlet of intense salt brine trickling down their beds.

TILLANDSIA BANDENSIS, Baker.

Hab.—A common epiphyte in the forests of the Pilcomayo.

TILLANDSIA HILAIREANA, Baker.

Hab.—Rio Pilcomayo. Abundant. Epiphytic on nearly every tree.

TILLANDSIA VERNICOSA, Baker.

Hab.—Rio Pilcomayo. Epiphytic.

TILLANDSIA TOMENTOSA, N. E. Br. (n. sp.).—Foliis rosulatis, caule brevioribus, basi subbulboso-convolutis, lineari-attenuatis, recurvis, convolutis, apice circinatis, utrinque dense squamuloso-tomentosis; caule foliis 2-3 instructis, superne in vaginis dense lepidotis abeuntibus; spicis fasciculato-paniculatis, distichis (pedunculis in vaginis

occultis, apice fasciculatim 3-4 spicatis), recurvis, 6-12-floris, bracteis ovato-lanceolatis, conduplicatis, obtusis vel acutis, lepidotis vel subglabris, imbricatis, calycem subæquantibus; sepalis oblanceolato-oblongis subobtusis, glabris, unguis petalorum æquantibus; petalis roseo-purpureis, laminis subrotundis; staminibus styloque inclusis.

Hab.—Rio Pilcomayo, Kerr!

Folia 6-8 poll. longa, basi $\frac{1}{2}$ poll. lata. Caulis 16-18 poll. longus. Spicæ $1\frac{1}{2}$ -3 poll. longæ, $\frac{1}{4}$ poll. latæ. Bracteæ 5-7 lin. longæ, $2\frac{1}{2}$ -3 lin. latæ. Sepala 6-7 lin. longa, $2\frac{1}{2}$ lin. lata. Petalorum lamina 5 lin. diam.

This species, I think, should be placed near *T. streptophylla*, but is abundantly distinguished from that and all allied species by having the recurving flower-spikes grouped in four or five distant fascicles, forming a distichous panicle 6 or 7 inches long by 4 or 5 inches broad (N. E. Brown).

Hab.—Rio Pilcomayo. Epiphytic. Common.

CYPELLA GRACILIS, Baker.

Hab.—Rio Pilcomayo.

CYPELLA HERBERTI, Herb.

Hab.—Fortin Page. Open campo. Fl. 9th Oct.

MAYACA SELLOWIANA, Kunth.

Hab.—Rio Pilcomayo. Creeping on ground in damp spots in forest.

COMMELINA VIRGINICA, L. (*C. sulcata*, Willd.).

Hab.—Rio Pilcomayo. Very common in shady spots.

Of palms, I found three species conspicuous on the banks of the Pilcomayo, *Copernicia cerifera*, *Trithrinax brasiliensis*, and *Cocos australis*.

COCOS AUSTRALIS, Mart.

This, a tall and beautiful palm called *Pindó* in Guaraní, and *Chaik latéé* in Toba, was not found in the immediate neighbourhood of Fortin Page. Along the lower reaches of the Pilcomayo, and on the banks of the Rio Bermejo, it is a conspicuous object growing singly and solitary in the dicotyledonous forest. The fleshy pericarp of its drupaceous fruit is sweet and wholesome, while the heart of the crown is also used as a vegetable.

TRITHRINAX BRASILIENSIS, Mart.

Toba, *Laiardái*.

Hab.—Fortin Page. Common in the “monte duro” of the Pilcomayo. Flowered 1st February.

This species of palm occurred not infrequently around Fortin Page, where it was entirely confined to the montes. Growing as it did in the comparative twilight, it was usually slender and much drawn out, the stem being often 10 or 15 feet in length; and oftener prostrate or semi-prostrate than erect.

COPERNICIA CERÍFERA, Mart.

Hab.—Rio Bermejo; Rio Pilcomayo.

This, the *Carandái* or *Palma Negra* of the Paraguaians, the *Chaik* of the Tobas, is the most characteristic palm in the region of Fortin Page, and in fact in the Gran Chaco as a whole. Vast regions in the low-lying parts of the Chaco, occupying many thousand square miles covered with rank grass are dotted all over with *Carandái* palms, forming immense palm groves or palmares.

The *Carandái* palm averages about 30 feet in height. It has a smooth stem about seven inches in diameter, marked externally with shallow depressions indicating the leaf scars. Great variability exists in the degree of persistence of the leaf bases. In the young palms they are decidedly persistent, the withered lamina being merely broken off by the wind, but after reaching a height of several feet the leaves are cleanly shed. The persistence of the hard spiny leaf-bases around the young stem must evidently be of great use in preserving it from the attacks of deer and other vegetable feeders; the protection being no longer required higher up. The average height of the *Carandái* palms on the Pilcomayo is, as I have said, about 30 feet. Two exceptionally tall individuals of which I took the altitude measured 72 feet 6 inches, and 62 feet 10 inches, and the former must, I think, be about the limit of height above which the wind pressure on the leafy head becomes too great for stability. Occasionally, but, comparatively speaking, very rarely, I came across specimens whose stem divided up into several branches. One tall palm bifurcated about 45 feet from the ground. One of

those primary limbs bore a leafy crown, the other one bifurcated twice in succession and then split up into a large number of irregular terminal branches, about 20 in all.

The stem of the *Carandai* is very hard and dense, and very dark in colour, which in fact is the origin of the name *Palma Negra*—black palm. (In what appeared to be a distinct variety the stem remained comparatively soft, and the leaf bases were here much more persistent). These hard trunks are much used in the construction of houses, serving admirably for rafters and pillars.

The *Carandai* came into flower about 10th December, and ten days later was in full flower. The flowers are borne on branches 7 feet or so in length, and have a rich and fruity scent.

The fruit of this species is not edible, but the young and tender heart we found to be so, and amongst the Indians this *Chaik kum* is a regular article of diet.

TYPHA sp.

Abundant in fresh-water marshes. The male flowers are eaten by the Indians; they are rather tasteless, but contain a certain quantity of nourishment. Fl. 11th Dec.

PISTIA sp.

Very abundant in all the fresh-water pools, in company with *Azolla magellanica*. Fl. 11th Dec.

ANTHURIUM sp.

Possibly a new species, but material is insufficient for description.

Hab.—Damp spots in the forest, Rio Pilcomayo.

ECHINODORUS FLORIBUNDUS, Seub., var.

Hab.—Fortin Page. Very common in palmar. Fl. 15th Sept.

CYPERUS FLAVUS, Vahl.

Hab.—Rio Pilcomayo.

CYPERUS GIGANTEUS, Vahl.

Hab.—Rio Pilcomayo.

CYPERUS MEYENIANUS, Kunth.

Hab.—Rio Pilcomayo.

CYPERUS sp.

Hab.—Rio Pilcomayo.

KYLLINGA ODORATA, Vahl.

Hab.—Rio Pilcomayo.

ELEOCHARIS GENICULATA, R. Br.

Hab.—Rio Pilcomayo.

FIMBRISTYLIS VELATA, R. Br.

Hab.—Rio Pilcomayo.

SCIRPUS PARAGUAYENSIS, Maury.

Hab.—Fresh-water marshes on Rio Pilcomayo. Fl.

Sept.

PASPALUM NOTATUM, Flügge.

Hab.—Campo about Fortin Page, Rio Pilcomayo.

PASPALUM QUADRIFARIUM, Lam., Glabrous form.

Hab.—Rio Pilcomayo. Lat. $24^{\circ} 47'$ S. Common.

PASPALUM RUFUM, Nees.

Hab.—Rio Pilcomayo.

PASPALUM TRISTACHYON, Lam.

Hab.—Rio Pilcomayo.

ANTHÆNANTIA LANATA, Benth.

Hab.—Rio Pilcomayo.

PANICUM CAPILLARE, L.

Hab.—Rio Pilcomayo. Frequent.

PANICUM RIVULARE, Trin.

Hab.—Margin of Rios Paraná and Paraguay.

PANICUM SPECTABILE, Nees.

Hab.—Rio Pilcomayo.

OPLISMENUS SYLVATICUS, Roem. et Schultes.

Hab.—Covering ground in more open and dry parts of the forest, Rio Pilcomayo.

SETARIA GLAUCA, Beauv.

Hab.—Rio Pilcomayo. Lat. $24^{\circ} 47'$ S.

IMPERATA BRASILIENSIS, Trin.

Hab.—Rio Pilcomayo. Covering large patches in the open campo.

CHLORIS POLYDACTYLA, Kunth.

Hab.—Rio Pilcomayo.

DIPLACHNE VERTICILLATA, Nees et Mey.

Hab.—Forests near mouth of Rio Pilcomayo.

CHEILANTHES MICROPHYLLA, Sw.

Hab.—Same locality as last.

CHEILANTHES PEDATA, A. Br.

Hab.—Rio Paraguay.

CHEILANTHES RADIATA, R. Br.

Hab.—Forests near mouth of Rio Pilcomayo.

PTERIS PALMATA, Willd.

Hab.—Common on prostrate tree trunks in damp forests on the Lower Pilcomayo.

NEPHRODIUM MOLLE, Desv.

Hab.—Common in forests of Lower Pilcomayo.

POLYPODIUM ANGUSTUM, Mett.

Hab.—On prostrate trunks in same locality as the preceding species.

POLYPODIUM INCANUM, Sw.

Hab.—Forests of Lower Pilcomayo.

GYMNOGRAMME RUFA, Desv.

Hab.—On prostrate tree trunks in forests of Lower Pilcomayo.

ANEMIA TOMENTOSA, Sw.

Hab.—Rio Pilcomayo.

AZOLLA MAGELLANICA, Willd.

Very abundant upon fresh-water lagunas everywhere, forming a continuous carpet over their surface, green in the younger plants, reddish in the older. Sporangia developed during July, August, and September, *i.e.*, as the waters dry up and the plants are left stranded.

USNEA BARBATA, var. CERATINA, Sch.

Prov. Arg., *Barbara del monte*.

Hab.—Abundant on trees in the montes of the Pilcomayo.

A NEW SPECIES OF PHACELOCARPUS. By E. M. HOLMES, F.L.S.

(With Plate I.)

(Read March 1892.)

In the *Epicrisis Systematis Floridearum*, Dr. Agardh describes six species of the genus, and another has since been added by him in *Till Algernes Systematik*, iv. p. 57. These algae are confined to the coasts of Australia, New Zealand, and South Africa. The genus has been divided into two sections, the first, *Euctenodus*, having compressed, pinnately decompound, linear branches and branchlets, which are distichously pinnate throughout, and the second, *Phacelocarpus*, a more or less cylindrical or terete irregularly branched frond, with the ultimate pinnules or teeth arranged in an irregularly spiral manner around the stem.

The first section includes *P. alatus*, *P. complanatus*, *P. sessilis*, *P. apodus*, and *P. Labillardierii*, and the second, *P. tortuosus*, and *P. tristichus*. The new species about to be described is intermediate between these two sections, in having the branches and branchlets distichous, but the stem twisted at the innovations, so as to give a pseudo-spiral appearance to the frond. It further differs from all the known species in having the fructification attached, not to the teeth, but to the surface of the frond. The name here given to the plant is in allusion to the latter peculiarity.

PHACELOCARPUS EPIPOLÆUS* (n. sp.).

Fronde basi teretiuscula, immerso-costata inferne sensim nudiuscula, superne complanata, ramis corymboso-pinnatis, pinnis linearibus pectinato-pinnatis, ala angustissima instructa, dentibus compressis latitudinem rachidis ita formatæ sua longitudine æquantibus vel paululo superantibus, planis, a basi latiore acuminatis, incurvis. Cystocarpis reniformibus breviter pedicellatis alterutra pagina affixis; nematheciiis ovato-globosis breviter pedicellatis;

*Some specimens of the plant have been distributed under the MS. name of *P. disciger*. The name *epipolæus*, being of Greek derivation, is, however, substituted here as more suitable.

antheridiis subsessilibus oblongo-ovatis pallidis, similariter affixis.

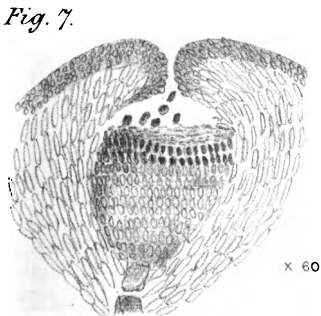
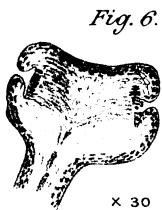
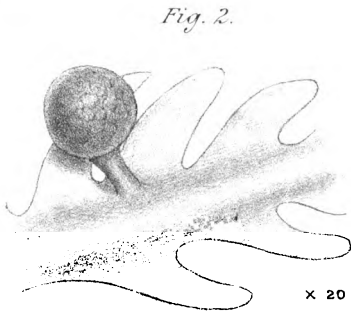
Hab.—Ad Africam Australem, prope ostiam fluminis Kowie. Dr. H. Becker.

This interesting species was sent with several other new marine algae from a district in South Africa which appears to have a peculiarly rich algal flora. The plant now under consideration attains, so far as can be judged from the specimens received, a length of 12–18 inches. The stem, which is terete at the base for about 2 inches of its length, arises from a discoid base. The branches, which nowhere exceed a line in diameter, are very irregularly pinnate, two or three ramuli frequently arising near together at variable intervals, and all the branches showing a tendency to corymbose branching towards their apices. The innovations occur at intervals of $\frac{1}{4}$ to $\frac{3}{4}$ inch, and as the frond is slightly twisted at each innovation, it assumes, before pressure, a somewhat spiral appearance. The nemathecium, cystocarps, and antheridia occur on distinct plants, and are situated between the midrib and the margin of the frond, *never in the axils of the teeth, nor on the margin of the teeth*, as in other species. They occur on both sides of the frond, and occasionally two or three are grouped together. The cystocarps are shortly stalked, not perfectly smooth, and are compressed and reniform, closely resembling in shape the sporangium of a Lycopodium. The nemathecium are shortly stalked, and vary in shape from globose to broadly oval. The antheridia are of a yellowish tint, nearly sessile, and ovate or ovate-oblong. The latter organ has not, that I am aware of, been previously described in the genus *Phacelocarpus*. The cells form a dense layer on the surface of the antheridium.

The drawings illustrating this paper have kindly been made for me by my friend and collaborateur Mr. E. A. L. Batters, M.A., B.Sc., F.L.S.

EXPLANATION OF FIGURES IN PLATE I.

1. Portion of plant, natural size.
2. Magnified portion of branchlet showing position of the pedicel on the surface of the frond.
3. Tetrasporic fruit, showing the lateral cavities containing the tetraspores.
4. A cavity magnified.
5. An isolated tetraspore with paraphyses.
6. A cystocarpic fruit.
7. Longitudinal section of the same.
8. Antheridium.



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PHAELOCARPUS EPIPOLÆUS.

MEETING OF THE SOCIETY,

Thursday, January 11, 1894.

Professor BOWER, President, in the Chair.

Mrs. A. DOWELL was elected Resident Fellow of the Society.

Miss CHARLOTTE C. PEARSON and Miss ELIZABETH MADDEN were elected Lady Members of the Society.

Dr. J. J. MOONEY was elected Non-Resident Fellow of the Society.

The PRESIDENT referred to the loss the Society had sustained by the death of RICHARD SPRUCE, Honorary British Fellow of the Society, and commented upon the value of his work.

Presents to the Library at the Royal Botanic Garden were announced.

The TREASURER submitted the following Statement of Accounts for the Session 1892-93 :—

RECEIPTS.

Annual Subscriptions, 1892-93, 74 at 15s.,	£55 10 0
Do. do. 1892-93, 1 at 15s.,	0 15 0
Compositions for Life Membership,	16 16 0
Transactions, etc., sold,	4 6 6
Diploma, Fees,	0 14 5
Interest received,	0 4 0
Subscriptions to Illustration Fund,	22 17 0
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	£101 2 11

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PAYMENTS.

Printing Transactions, £44, 0s. 6d.; Billets, etc., £9, 9s.,	£53	9	6
Lithographing,	0	13	9
Rooms for Meetings, and Tea,	6	2	0
Charter Box, etc.,	1	7	6
Commission paid to Collector of Subscriptions,	0	10	6
Postages, Carriages, etc.,	9	5	10
Fire Insurance on Books,	0	5	0
	<hr/>		
Payments,	£71	14	1
Balance of Receipts,	29	8	10
	<hr/>		
	£101	2	11

STATE OF FUNDS.

Amount of Funds at close of Session 1891-92,	£36	2	2
Increase during Session 1892-93, as above,	29	8	10
	<hr/>		
Amount of Funds at close of Session 1892-93,	£65	11	0
Being:—Sum on Current Account with Union			
Bank of Scotland,	£5	7	1
Sum in Deposit Receipt do.	70	0	0
	<hr/>		
	£75	7	1
Less due to Treasurer,	9	16	1
	<hr/>		
	£65	11	0

EDINBURGH, 30th December 1893.—Certified as a correct Abstract of the Treasurer's Accounts, which have been audited by me, compared with the Vouchers, and found correct.

ROB. C. MILLAR, C.A., Auditor.

The TREASURER intimated the receipt since last meeting of the following subscriptions to the Illustration Fund:—

P. Neill Fraser,	£2	0	0
Dr. H. H. Johnston,	1	0	0

Mr. MALCOLM DUNN exhibited specimen of root of elm gnarled and contorted through its growth in unsuitable stony soil, several stones being overgrown by the wood of the root.

Mr. CAMPBELL sent specimens of *Anemone*, *Eranthis*, and *Galanthus* in flower, from his garden at Ledaig, Argyllshire, accompanied by good wishes in rhyme to the Society for the New Year.

Mr. T. CUTHBERT DAY exhibited twin and quadruple barley corns from grain grown in France.

Surgeon-Captain H. H. JOHNSTON exhibited specimens of *Ficus* from Mauritius, beautifully dried and showing the fruit uncompressed, and therefore preserving their features in a way the crushed specimens of the genus, as usually found in herbaria, do not show them. He remarked that Mr. Scott, Assistant-Director (now Director) of the Botanic Garden at Pamplemousses, Mauritius, had found that he could not raise the endemic *F. mauritiana* from seed, and in explanation of this Dr. Johnston stated that he had failed to find a single perfect achene in many fruits he had examined. On opening a fresh ripe fruit he noticed a swarm of flies flew out, and the achenes all showed a puncture at one end and were empty.

Mr. J. H. BURRAGE exhibited twigs of the Peruvian shrub *Ercilla volubilis*, A. Juss, showing remarkable root-cushions in the axils of the leaves. These are developed only on twigs which are adjacent to a support, such as a wall; they do not appear on twigs growing erect in the air away from a support. A further communication upon the structure and development of these cushions was promised.

Professor BAYLEY BALFOUR exhibited:—A specimen of *Orchis maculata*, showing regular peloria of the perianth. The six parts are all alike in size and form, the labellum wanting the spur, but the androecium and gynæceum are normal. The specimen was found and sent by Miss Munro, Alness, Caithness. Specimens sent by Mr. Walter Berry, Atholl Crescent, of piles bored by teredo; also a series of dried leaves of *Banksia serrata*, prepared by Mr. Harrow, from a plant in the temperate house of the Royal Botanic Garden, showing remarkable heterophylly.

The following papers were read:—

AFRICAN SPECIES OF THE GENUS *FICUS*. By G. F. SCOTT ELLIOT, B.Sc.

AN OLD LIST OF "STATIONS OF RARER PLANTS ASCERTAINED TO GROW ROUND INVERKEITHING AND NORTH OF THE FORTH. By A. ROBERTSON." Communicated by Prof. BAYLEY BALFOUR.

Amongst some old papers of the late Professor J. H. Balfour, recently come into my hands, I find one with the title quoted above, which appears to me to be worthy of being laid before the Society. Although the information it contains must have been utilised in the preparation of Balfour and Sadler's Flora of Edinburgh, there are stations noted in the list which do not appear in that work, and in view of the many surface changes in the area included in the list, brought about by new lines of railway communication through it, and the prospect this opens out of the introduction of alien plants, it may be, I think, useful to workers in the future to have before them such a list, showing what botanists of fifty years ago knew of the rarer and introduced plants of the district. Appended to the list is the following note:—

"All the plants marked 'Pitreavie' are decidedly introduced (old garden).

"The Culross plants—*Doronicum Pardalianches*, *Galanthus*, *Narcissus*, and *Hypericum Androsæmum* are at best suspicious; also *Euphorbia Lathyris* and *Arum*.

"The St. David's plants,—(excepting *Thalictrum flavum* and *Allium arenarium*)—some decidedly introduced, others suspicious.

"The Inverkeithing plants—*Saponaria officinalis*, *Nasturtian sylvestre* and *Sinapis muralis* (also at Charlestown), decidedly introduced.

"The Cleish plants—(*Arabis Turrita*), *Actæa*, *Meconopsis*, *Valeriana pyrenæica*, *Hieracium amplexicaule*, *Convallaria*, *Arum*, either decidedly introduced or suspicious (old garden), also *Doronicum plantagineum*, *Smyrniolum Olusatrum*; and *Peucedanum Ostruthium* probably introduced at both stations.

"*Petasites albus* and *Saxifraga umbrosa* certainly introduced. *Prunus domestica* and *insititia* and *Fragaria elatior* probably introduced; and also *Acer campestre*, *Petroselinum*, and *Apium* certainly introduced; and also *Carum Carui*.

"*Hieracium aurantiacum* introduced, also *Medicago sativa* and *maculata*; *Hesperis matronalis* suspicious also.

"The Inchcolm plants—*Crambe*, *Verbascum Thapsus*, and *Brassica campestris*; *Dianthus Caryophyllus* certainly introduced."

I have not been able to assure myself as to the identity of "A. Robertson," the writer of the list, but possibly some older members of the Society may be able to furnish information on this point.*

- Acer campestre*—North Ferry.
Aconitum Napellus—near Fordel, Inverkeithing. A. Robertson, 1834.
Actæa spicata—Cleish (old garden).
Adoxa Moschatellina—Fordel, Woodmill near Dunfermline, near Culross.
Aira præcox—Ferry Hills.
 — *caryophyllea*—Do.
 — *flexuosa*—Culross, Cleish Hills, Cullelo Hill.
Ajuga reptans—Ferry Hills, Fordel, etc.
Alisma ranunculoides—Loch Head, 2 miles north of Dunfermline, Loch Leven.
Allium arenarium—Pitreavie near Dunfermline, near St. David's. A. Robertson, in company with Dr. Wallich, 1834.
 — *vineale*—Ferry Hills, in many places.
Andromeda polifolia—said to have been found on the Cleish Hills by Lady Adam; since then often sought in vain by other botanists.
Anagallis cœrulea—single specimen found by Dr. Dewar north of Inverkeithing.
Anchusa sempervirens—Culross (A. Robertson), Pitreavie (Dr. Dewar).
Angelica sylvestris—Dalmeny Woods, Culross, Lethan's Glen, seven miles north of Dunfermline.
Anthemis arvensis—about Inverkeithing in several places. A. Robertson, 1835.
 — *cotula*—Do.
Apium graveolens—Culross. A. Robertson, 1834.
Aquilegia vulgaris—Pitreavie. Dr. Dewar.
Arabis hirsuta—near Inverkeithing, Ferry Hills.
 — *Turrita*—Cleish.
Arbutus uva-ursi—said to have been found on Cleish Hills by an English botanist; since sought for in vain.
Arenaria marina—near Inverkeithing.
 — *rubra*—Do.
 — *serpyllifolia*—Do.
 — *trinervis*—Do., abundant near Cleish and Saline
Artemisia Absinthium—Ferry Hills, Burntisland.
Arum maculatum—Culross, Pitreavie, Cleish.
Aspidium aculeatum (?) or *lobatum*—Fordel. A. R., 1832.
 — *lobatum*—Cleish Hills and Lethan's Glen.

* Since communicating this list to the Society I have received, from Dr. William Craig, one of the Vice-Presidents, the following note, which seems to settle this question:—"At a meeting of the Botanical Society, 10th November 1836, Professor Graham in a paper (see *First Report*, page 38) in a record of rare plants mentions *Campanula Trachelium*, near Donibristle, Fife (Rev. A. Robertson). This Rev. A. Robertson was Parish Minister of Inverkeithing, and wrote the account of that parish in the New Statistical Account of Scotland (see vol. ix. page 230, also page 234), where you have an interesting notice of the Botany of the Parish. This was published in 1845. This Rev. Andrew Robertson was ordained in 1792, and must have been nearly fifty years minister of Inverkeithing. He had a son also Rev. A. Robertson, but where he was minister I do not know. Does this throw any light on the 'A. Robertson' who sent a list of plants to your father? See also bottom of page 40, and top of page 41 of *First Report* of Botanical Society for a Miss Robertson, likely his daughter."

- Aspidium lonchiloides*—Cleish Hills.
 — *Oreopteris*—Do.
Asplenium Adiantum-nigrum—Ferry Hills, many places.
 — *marinum*—near Limekilns, Starleyburn, Ravenscraig Castle near Kirkcaldy.
 — *Trichomanes*—Ferry Hills, near Auchtertool, Cleish Hills.
 — *Ruta muraria*—Ferry Hills, walls at Donibristle.
Aster Tripolium—near Inverkeithing, Torryburn (abundant).
Astragalus glycyphyllos—Ferry Hills two places, Dalmeny Woods.
 — *hypoglossis*—Ferry Hills, and along coast eastward.
Atroplex angustifolia—near Inverkeithing, abundant.
 — *laciniata*—Do., very rare.
 — *littoralis*—Do., plentiful.
Atropa Belladonna—Donibristle, near Torryburn.
Avena pratensis—Ferry Hills, abundant.
Ballota nigra—North Ferry, St. David's.
Betonica officinalis—Glenfarg, between Kinross and Perth.
Bidens cernua—Fordel.
 — *tripartita*—Loch Leven.
Blechnum boreale—woods northward, everywhere.
Blysmus rufus—near Starleyburn.
Botrychium Lunaria—Blairadam, Lethan's Glen, Pettycur.
Brachypodium sylvaticum—near the sea, everywhere.
Brassica campestris—Inchcolm. A. Robertson, 1834.
 — *Napus*—St. David's, Inverkeithing.
Bromus rigidus—St. David's. Dr. Wallich and A. Robertson, 1834.
 — *diandrus* (?)—near Kinross, Inverkeithing (?).
Cakile maritima—shore at Ferry Hills.
Calluna vulgaris (*downy*)—abundant at Culross.
Camelina sativa—occasionally at St. David's, Charlestown, Culross.
Campanula glomerata—Pettycur.
 — *ranunculoides*—near Kirkcaldy.
 — *latifolia*—Cleish, Castle-Campbell.
Cardamine amara—Cleish, Dhu Craig six miles west of Dunfermline.
 — *hirsuta*—Culross, near Inverkeithing.
Carduus acanthoides—near Inverkeithing.
 — *tenuiflorus*—Do., abundant.
Carduus marianus—Inverkeithing, Charlestown.
Carex extensa—Starleyburn.
 — *limosa*—Otterston Loch. Dr. Graham, 1835.
 — *vulpina*—shores near Inverkeithing, several places.
Castanea vulgaris—Pitreavie, Dalmeny Woods (introduced).
Cerastium semidecandrum—Ferry Hills.
 — *tetrandrum*—Do.
Chærophyllum temulentum—Fordel Woods.
Cheiranthus Cheiri—old church of Dunfermline.
Chelidonium majus—Carnock, Culross. Dr. Dewar, 1835.
Chenopodium maritimum—shore near Inverkeithing.
 — *Bonus Henricus*—near Inverkeithing.
 — *urbicum*—Ferry Hills.
 — *rubrum* (?), etc. St. David's.
Chrysanthemum segetum—Ferry Hills and north of Inverkeithing (abundant).
Chrysosplenium alternifolium—Woodmill, Cleish, Fordel.
Cicuta virosa—Otterston Loch, Hillhead Loch three miles north of Dunfermline.
Circæa alpina—rivulet near Crook of Devon.
 — *lutetiana*—Aberdour Woods, Lethan's Glen, Castle-Campbell, Pittencreeff at Dunfermline.
Cystopteris fragilis—Castle-Campbell, Glenfarg.
Clinopodium vulgare—Burntisland, near Dunfermline, Cullelo Hills.
Cnicus heterophyllus—Lethan's Glen, near Auchtertool.
Cochlearia danica—Inchcolm. A. R., 1834.
Convallaria multiflora—Cleish (old garden).
 — *majalis*—Pitreavie (old garden).
Convolvulus sepium—Ferry Hills, near Dunfermline.
Corallorhiza innata—between Dunfermline and Culross. Dr. Dewar, in company with A. Robertson, 1835.
Coriandrum sativum—St. David's. Dr. Wallich and A. Robertson, 1834.
Cornus sanguinea—Culross, Pitreavie (introduced).
Coronopus Ruelli—Burntisland, St. David's.
Corydalis claviculata—Culross. A. Robertson, 1834.

- Crambe maritima*—Inchcolm.
Cryptogramme crispa—West Lomond Hill.
Cynoglossum officinale—Rosyth Castle, Donibristle, Burntisland.
Dianthus deltoides—Dunearn Hill.
— *Caryophyllus*—Monastery, Inchcolm.
Dipsacus sylvestris—Charlestown, Donibristle, Inchcolm.
Doronicum Pardalianches—Culross.
— *plantagineum*—Cleish.
Eleocharis acicularis—Loch Leven, Lochgelly (large size).
— *cæspitosa*—Cleish Hills and Saline Hills.
Empetrum nigrum—Cleish Hills.
Epilobium angustifolium—Cleish Hills, Lethan's Glen, Pitreavie.
— *tetragonum*—marshy ground near Inverkeithing.
Epimedium alpinum—near Saline (introduced).
Epipactis latifolia—Blairadam.
Equisetum hyemale—Cleish Hills, Blairadam.
— *sylvaticum*—near Inverkeithing.
Eriophorum angustifolium—marsh east of Dalgety Church.
— *polystachyon*—Ferry Hills.
Ervum tetraspermum—St. David's. A. Robertson, 1835.
Erysimum Alliaria—east of Inverkeithing (most abundant).
Erythraea littoralis—Burntisland. A. Robertson, 1835.
Euonymus europæus—Pitreavie (introduced).
Eupatorium cannabinum—Starleyburn, near St. David's.
Euphorbia exigua—Ferry Hills, and near Limekilns.
— *Lathyrus*—Pitreavie, Culross.
— *Paralias*—St. David's. A. Robertson, 1834.
— *portlandica*—St. David's. A. Robertson, 1834.
Fedia dentata—Ferry Hills, near Limekilns.
Festuca rubra—Ferry Hills.
— *pratensis*—Do.
— *duriuscula*—Do.
— *rubra*—Do.
— *Myurus*—Do.
Fragaria elatior—near Fordel.
Gagea lutea—Auchtertool.
Galanthus nivalis—Culross, Pitreavie, near Saline.
Galeopsis versicolor—about Cleish, Inverkeithing.
Galium uliginosum—marshes near Pitreavie and Cullelo.
Genista anglica—Dhu Craig, Dollar, Cleish Hills.
Gentiana campestris—Ferry Hills, Blairadam, Burntisland.
Geranium lucidum—Cleish, near Dunfermline.
— *sylvaticum*—Lethan's Glen, Blairadam.
Glaucium luteum—Charlestown.
Gnaphalium dioicum—Ferry Hills.
— *germanicum*—Do.
— *sylvaticum*—Do.
— *minimum*—Do.
— *uliginosum*—marshy ground, many places.
Grammitis Ceterach—Kinnoull Hill, Perth.
Gymnadenia Conopsea—Ferry Hills, moist ground north of Dunfermline.
Habenaria albida—Cleish Hills, Lethan's Glen.
— *bifolia*—north of Dunfermline.
— *viridis*—Do., Ferry Hills, east of Kinghorn.
Helianthemum vulgare—Ferry Hills.
Heliosciadium inundatum—marsh east of Dalgety Church.
Hesperis matronalis—Primrose near Dunfermline, fields about Charlestown.
Hieracium amplexicaule—Cleish.
— *aurantiacum*—grass field near Aberdour. A. Robertson, 1832.
— *molle*—Lethan's Glen.
— *sabaudum*—Do.
— *denticulatum*—Do.
Hippuris vulgaris—Otterston Loch, near Carnock.
Hordeum murinum—about Inverkeithing.
Hymenophyllum Wilsoni—ravine near Crook of Devon.
Hypericum Androsæmum—Culross. A. R., 1834.
— *hirsutum*—Lethan's Hill and coast east of Inverkeithing, Starleyburn.
— *humifusum*—Cleish, Dollar.
— *perforatum*—Ferry Hills.
— *pulchrum*—Do.
— *quadrangulum*—burn north-west of Inverkeithing, Starleyburn.
Iris foetidissima—Fordel Woods. A. Robertson, 1835.
Juncus compressus—marshes, shore west of Inverkeithing.
— *glaucus*—marsh, Ferry Hills.
— *uliginosus* and *subverticellatus*—marsh, Ferry Hills.
Juniperus communis—Dhu Craig.
Lastrea virosa—Kinnoull Hill.

- Lamium maculatum*—Carnock. Dr. Dewar.
 — of Smith—near Culross.
 Dr. Dewar.
Lavatera arborea—Inchgarvie.
Leontodon palustris—Ferry Hills, Cleish.
Lepidium campestre—Ferry Hills, Culross, Burntisland, Kinross.
 — *ruderales*—St. David's. A. Robertson, 1835.
 — *latifolium*—Dalgety. A. R., 1832.
Ligusticum scoticum—shore at Inverkeithing, Inchcolm (most plentiful).
Linaria cymbalaria—Cleish, east of Kinghorn.
 — *repens*—Inverkeithing.
Listera ovata—Donibristle, north of Dunfermline.
 — *Nidus-avis*—Blairadam.
 — *cordata*—wood between Dunfermline and Culross. Dr. Dewar, in company with A. Robertson, 1835.
Lithospermum officinale—Culross. Drs. Dewar and Currer, 1834.
Littorella lacustris—loch near Auchtertool, Lochgelly, Loch Leven, Loch Fittie, Cleish Lochs.
Lobelia Dortmanni—one of the Cleish Lochs, Loch Leven. Dr. Currer.
Lonicera Xylosteum—near Dunfermline. Dr. Dewar.
Lotus tenuis—Donibristle.
Luzula pilosa—Lethan's Glen, Woodmill, Culross.
 — *congesta*—Cleish Hills, about Dunfermline and Inverkeithing.
Lychnis viscaria—Glenfarg (abundant).
Lycopodium alpinum—Cleish Hills. Dr. Currer.
 — *Selago*—Do.
Lycopus europæus—near Dhu Craig. Dr. Dewar, in company with A. Robertson, 1835.
Lysimachia nemorum—Fordel, Cleish, Dollar.
 — *Nummularia*—Fordel and Donibristle (introduced).
Lythrum Salicaria—near Cleish.
Malaxis paludosa—Cleish.
Malva moschata—near Dunfermline. Dr. Dewar, Culross, near Fordel. A. Robertson.
Matricaria Chamomilla—abundant in many fields about a mile west of Inverkeithing. A. Robertson, 1832.
Meconopsis cambrica—Cleish.
Medicago sativa—Ferry Hills.
Medicago maculata—Donibristle; first found by A. Robertson, 1832; in great abundance, 1835.
Melampyrum pratense—Lethan's Glen.
Melica coerules—marshy places, a few miles inland from Inverkeithing and Burntisland, Lethan's Glen, Cleish Hills.
Melica nutans—Lethan's Glen. A. Robertson, 1834.
 — *uniflora*—Do., very fine near Auchtertool, Culross. A. R., 1835.
Melilotus officinalis—St. David's.
 — *leucantha*—St. David's, Charles-town, Inverkeithing. A. R., 1834.
Mentha gentilis (?)—near Dunfermline. Dr. Dewar, 1834.
 — *crispa* of Hooker (Brit. Flora, 3rd edition)—Glenfarg. Messrs. Arnott and Stewart, 1834.
 — *viridis*—Glenfarg, Crook of Devon, near Milnathort.
 — *piperita*—Glenfarg.
Meum athamanticum—Cleish.
Milium effusum—Lethan's Glen, Culross Woods. A. R.
Montia fontana—marshy ground near Inverkeithing. A. R.
Muscari racemosum—Pitreavie (once a garden). A. R., 1834.
Myosotis collina—Ferry Hills (abundant).
 — *caespitosa*—many marshes about Inverkeithing (usually mistaken for *palustris*).
 — *palustris*—rather rare, Lochgelly, Hillhead Loch.
 — *sylvatica*—abundant, Fordel, Donibristle.
Myrrhis odorata—Inverkeithing, Pitreavie, Cleish, abundant in many hedgerows about Auchtertool.
Narcissus Pseudo-narcissus—Willows west of Culross (abundant).
Nardus stricta—Inverkeithing, Cleish Hills.
Nasturtium terrestre—Loch Leven.
 — *sylvestre*—Inverkeithing.
Nuphar lutea—Lochgelly, Loch Fittie, Loch Hillhead, Cleish Loch.
Nymphaea alba—Loch Hillhead (abundant).
Enanthe crocata—shores near Inverkeithing, east and westward.
Ononis ramosissima—St. David's. A. Robertson, 1834.
Ophioglossum vulgatum—Blairadam.
Origanum vulgare—Starleyburn, Burntisland.
Ornithogalum umbellatum—Pitreavie (old garden).

- Ornithopus perpusillus*—Ferry Hills.
Osmunda regalis—Culross. A. R., 1834.
Oxytropis uralensis—Ferry Hills.
Parietaria officinalis—Inverkeithing (abundant).
Paris quadrifolia—Cleish Hills, Lethan's Glen, Culross.
Parnassia palustris—north of Dunfermline.
Pastinaca sativa—near Kincardine. Dr. Dewar, 1835.
Petasites albus—Cleish (Dr. Curren); glen near Auchtertool, apparently wild (A. Robertson, 1833).
Petroselinum sativum—Ferry Hills (escaped from a garden). A. R., 1834.
Peucedanum Ostruthium—Cleish, near Auchtertool.
Phalaris arundinacea—Inverkeithing.
 — *canariensis*—west of Dunfermline. Dr. Dewar.
Phleum arenarium—Burntisland.
Pimpinella Saxifraga—Ferry Hills.
Poa distans—Inverkeithing.
 — *procumbens*—Do.
 — *maritima*—Do.
 — *rigida*—Charlestown (Dr. Dewar), Burntisland.
Polygonum viviparum—Lethan's Glen.
 — *lappathifolium*—St. David's.
 — *Bistorta*—west of Dunfermline. Dr. Dewar.
 — *Fagopyrum*—near Inverkeithing.
 — *Hydropiper*—Do.
Polypodium Dryopteris—Cleish Hills, Blairadam, Lethan's Glen.
 — *Phegopteris*—Do.
Polypogon monspeliensis—St. David's. Dr. Wallich, in company with A. Robertson, 1834.
Potamogeton heterophyllus—Loch Fittie.
 — *pusillus*—Lochgelly.
 — *perfoliatus*—Do.
 — *crispus*—Otterston Loch, Lochgelly.
 — *lucens*—Lochgelly, Kinghorn Loch.
Potentilla verna—Ferry Hills.
 — *reptans*—Inverkeithing.
Primula elatior—Ferry Hills and shore westward.
Prunus domestica—Ferry Hills.
 — *insititia*—Fordel Woods.
 — *Padus*—Lethan's Glen (abundant), Culross.
Pyrethrum Parthenium—Donibristle, Fordel, Otterston, Culross.
Pyrus Malus—near Torryburn.
Radiola millegrana—near Saline, near Kinross.
Ranunculus auricomus—Lethan's Glen, Cleish, Fordel, Woodmill.
Reseda lutea—Limekilns, Inverkeithing, St. David's, Burntisland.
 — *luteola*—Ferry Hills.
Ribes rubrum—Culross.
Rosa rubiginosa—Ferry Hills.
 — *villosa*—Do.
 — *spinosissima*—Do.
Rotbolla incurvata—St. David's. A. Robertson, in company with Dr. Wallich, 1834.
Rubus saxatilis—Lethan's Glen.
 — *Idæus*—Inverkeithing, Lochgelly, Lethan's Glen, Auchtertool, etc.
Rumex acutus—Inverkeithing.
 — *sanguineus*—Culross.
 — *obtusifolius*—Inverkeithing.
Sagina maritima—Dalmeny Park.
Salicornia herbacea—Inverkeithing, Donibristle.
Salsola Kali—Inverkeithing, Charles-town.
Salvia Verbenaca—Burntisland, Kinghorn.
Sambucus Ebulus—Inverkeithing, St. David's, Cleish, Auchtertool.
Sanicula europæa—Lethan's Glen, Castle-Campbell, Woodmill.
Saponaria officinalis—Inverkeithing.
Saxifraga hypnoides—Lomonds, Castle-Campbell. Dr. Curren.
Scirpus maritimus—Ferry Hills.
 — *lacustris*—Loch Hillhead, Lochgelly, Loch Fittie.
Scleranthus annuus—Ferry Hills.
Scrophularia vernalis—Cleish, Kinross House (abundant). Dr. Curren.
Scutellaria galericulata—near Cleish.
Sedum Telephium—Ferry Hills.
 — *reflexum*—Inverkeithing.
 — *villosum*—Ferry Hills, Cleish Hills, Loch Hillhead.
Senecio (leaves linear; not in Hooker)—St. David's. A. Robertson, 1834.
 — *sylvaticus*—Ferry Hills.
 — *viscosus*—Do.
 — *aquaticus*—Cleish, etc., north of Dunfermline.
Setaria viridis—one plant, St. David's. A. Robertson, 1834.
Silene anglica—Ferry Hills. Dr. Graham, 1835.
Sinapis alba—Burntisland, St. David's.
 — *nigra*—St. David's.

- Sinapis muralis*—Charlestown (Dr. Dewar, 1834); Inverkeithing (A. Robertson, 1834).
 — *tenuiflorus*—St. David's.
Sisymbrium Thakiana—about Inverkeithing and Ferry Hills.
Smyrnium Olusatrum—Ravensraig Castle, south side of Kinghorn (abundant).
Solanum Dulcamara—Dalgety, Culross, Dhu Craig, etc.
 — *nigrum*—St. David's.
Solidago Virgaurea—Culross, Burntisland east and westward.
Sparganium natans—loch on Dunearn Hill, Loch Hillhead.
 — *simplex*—Loch Camela near Auchtertool, about Cleish.
Spergula subulata—Ferry Hills, many places.
Stachys arvensis—Ferry Hills and east of Inverkeithing.
Statice Armeria—shore Inverkeithing.
Stellaria nemorum—Cleish Woods.
Symphytum officinale—field near Limekilns.
 — *tuberosum*—Fordel, Pitreavie.
Thalictrum flavum—St. David's.
 — *majus*—Ferry Hills.
 — *minus*—Do.
Thlaspi arvense—Ferry Hills (abundant).
Torilis nodosa—Ferry Hills.
Tormentilla reptans(?)—near Inverkeithing.
Tragopogon major—Dunfermline, Burntisland.
Trientalis europæa—Dunfermline and northward (abundant).
Trifolium striatum—Ferry Hills (abundant).
 — *scabrum*—Burntisland.
Triglochin maritimum—shore Inverkeithing.
 — *palustre*—marshes northwards, Ferry Hills.
Triodia decumbens—Ferry Hills, Cleish, etc.
Triticum junceum—Ferry Hills, Burntisland.
 — *loliaceum*—Burntisland.
Trollius europæus—north of Dunfermline, Cleish (abundant).
Tulipa sylvestris—Pitreavie, Otterston, and North of Alloa.
Urtica urens—Inverkeithing.
Vaccinium Oxycoccus—Otterston, Cleish Hills.
 — *Vitis-idea*—Lethan's Glen, Dhu Craig.
Valeriana pyrenaica—Cleish.
Verbascum Thapsus—Inchcolm.
Veronica Anagallis—Burntisland.
 — *montana*—Cleish Hills.
 — *scutellata*—marsh east of Dalgety Church, Ferry Hills.
Viburnum Opulus—Dhu Craig, Culross, Lethan's Glen (all truly indigenous). Dr. Dewar and A. Robertson.
Vicia lathyroides—Ferry Hills.
 — *lutea*—Do., seven places (three additional ones in 1835 by A. R.).
 — *sativa*—St. David's, Dalmeny Woods. A. R., 1835.
 — *Bobartii*—Ferry Hills, St. David's. A. Robertson, 1835.
Viola hirta—Ferry Hills, Auchtertool, near Limekilns.
 — *lutea a*—north of Dunfermline, everywhere.
 — *lutea b*—near Inverkeithing, Cleish Hills. A. Robertson.
 — *odorata*—near Dunfermline, near Auchtertool.
 — *palustris*—marsh east of Dalgety Church, north of Dunfermline (abundant on the marshy hills).
Zannichellia palustris (?)—Loch Fittie.
Zostera marina—abundant between Burntisland and Pettycur.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING DECEMBER 1893. By ROBERT LINDSAY, Curator.

The month of December was very wet and unsettled, but it was an exceedingly mild month. Frost occurred on ten mornings, indicating collectively only 52° of frost for the month. So little frost has not been registered at the

garden for December since 1883. During December 1892 frost was registered on twenty-three mornings, the total amounting to 192° of frost. The lowest readings of the thermometer for last month occurred on the 1st, 22°; 2nd, 18°; 10th, 28°; 12th, 27°; 21st, 28°. The lowest day temperature was 31°, on the 1st, and the highest 58°, on the 16th. *Rhododendron Nobleanum*, *Hamamelis japonica*, *Jasminum nudicaule*, and *Petasites fragrans* were in full flower during December.

On the rock-garden four plants came into flower, viz.—*Helleborus grandiflorus*, *H. purpurascens*, variety, *Iris sophonensis*, and *Primula inflata*. The total number of species and well-marked varieties which have flowered on the rock-garden during the year 1893 amounts to 1114, as against 1212 for 1892. The largest number came into bloom during the month of May. The number of species which came into flower each month was as follows:—January, 13; February, 40; March, 81; April, 166; May, 300; June, 294; July, 112; August, 73; September, 28; October, 3; November, 0; December, 4.

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	22°	27°	31°	17th	38°	45°	53°
2nd	18	24	47	18th	38	42	48
3rd	33	43	51	19th	34	38	46
4th	40	45	51	20th	34	36	40
5th	36	40	52	21st	28	34	47
6th	42	49	53	22nd	35	43	50
7th	32	33	46	23rd	38	41	48
8th	36	42	47	24th	39	48	52
9th	32	36	41	25th	37	44	51
10th	28	32	42	26th	33	35	52
11th	30	34	40	27th	40	45	49
12th	27	34	39	28th	38	45	51
13th	25	32	39	29th	37	45	51
14th	29	35	46	30th	38	45	50
15th	34	43	53	31st	40	45	50
16th	40	50	58				

II. METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF DECEMBER 1893.

Distance from Sea, 1 mile. Height of Oistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32° (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direction.	
		Max.	Min.	Dry.	Wet.					
		°	°	°	°					
1	29.894	42.1	25.0	28.9	26.5	N.	Cir. St.	5	N.	0.000
2	30.302	29.7	21.5	24.8	23.9	W.	Cir.	1	N.	0.000
3	30.019	47.6	24.0	47.6	46.0	W.	{Cir. St. Cum.	8 1	N.W. W.	0.000
4	30.046	49.0	42.8	47.3	46.1	W.	Cum.	10	N.	0.030
5	30.137	49.6	38.0	41.0	40.2	S.W.	Cir.	2	S.W.	0.010
6	29.617	51.4	40.2	50.4	48.2	S.W.	Cum.	10	S.W.	0.490
7	29.279	51.8	34.1	35.7	35.1	S.W.	Nim.	10	S.W.	0.150
8	28.514	46.1	33.6	45.2	43.0	S.S.W.	Nim.	10	S.S.W.	0.130
9	28.903	46.3	35.0	37.6	35.8	W.	Nim.	5	W.	0.125
10	29.164	38.9	30.1	35.0	33.6	E.	...	0	...	0.055
11	29.168	42.9	34.0	35.9	34.0	W.	Cir. St.	5	S.W.	0.100
12	29.079	37.9	29.1	36.0	35.4	S.W.	Cum.	5	S.W.	0.140
13	28.769	39.7	27.9	33.9	33.8	N.E.	Nim.	10	N.E.	0.340
14	29.489	37.7	31.2	36.2	35.0	N.W.	Cum.	5	W.	0.010
15	29.852	45.9	35.0	44.8	43.2	N.W.	Cir. St.	4	N.W.	0.005
16	30.009	53.8	44.2	52.3	50.1	S.W.	Cum.	10	S.W.	0.000
17	30.049	53.7	41.8	44.9	42.9	S.W.	...	0	...	0.000
18	29.635	46.7	32.8	44.1	41.6	S.	Cir. St.	4	S.	0.010
19	29.106	47.4	36.9	40.0	39.8	S.E.	Cum.	10	S.E.	0.020
20	28.709	46.0	36.0	37.1	35.3	W.	{Cir. St. Cum.	8 2	S.W. W.	0.000
21	28.932	38.4	31.7	35.6	34.2	S.W.	...	0	...	0.005
22	29.186	46.6	35.1	46.1	43.6	S.W.	Cum.	10	S.W.	0.075
23	29.667	49.5	40.2	42.3	40.8	W.	...	0	...	0.000
24	29.708	47.0	40.8	46.7	43.7	S.	Cir. St.	10	S.	0.530
25	29.639	50.5	38.0	38.7	37.0	S.W.	...	0	...	0.070
26	30.148	41.9	34.8	36.3	36.0	W.	...	0	...	0.000
27	30.091	46.7	35.5	46.7	44.1	S.W.	Cum.	5	S.W.	0.110
28	30.325	49.4	45.7	47.3	47.0	S.W.	Cum.	10	S.W.	0.000
29	30.500	50.0	43.2	46.2	44.6	S.W.	Cum.	10	S.W.	0.000
30	30.493	49.6	39.0	47.0	44.2	W.	Cum.	8	W.	0.000
31	30.350	48.8	41.1	43.6	42.0	W.	...	0	...	0.040

Barometer.—Highest Observed, on the 29th, = 30·500 inches. Lowest Observed, on the 8th, = 28·514 inches. Difference, or Monthly Range, = 1·986 inch. Mean = 29·638 inches.

S. R. Thermometers.—Highest Observed, on the 16th, = 53°·8. Lowest Observed, on the 2nd, = 21°·5. Difference, or Monthly Range, = 32°·3. Mean of all the Highest = 45°·9. Mean of all the Lowest = 35°·4. Difference, or Mean Daily Range, = 10°·5. Mean Temperature of Month = 40°·6.

Hygrometer.—Mean of Dry Bulb = 41°·1. Mean of Wet Bulb = 39°·6.

Rainfall.—Number of Days on which Rain fell = 20. Amount of Fall = 2·445 inches. Greatest Fall in 24 hours, on the 24th, = 0·530 inch.

A. D. RICHARDSON,
Observer.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING 1893.
Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-level, 71·5 feet. Hour of Observation, 9 A.M.

Months.	Barometer, corrected and reduced to 32°. (Inches.)					Thermometers, protected, 4 feet above grass. Self-Registering Thermometers.												Hygrometer.		Rainfall. (Inches.)		
	Highest Observed.		Lowest Observed.		Range	Mean.	Highest Observed.		Lowest Observed.		Range	Mean of all the Highest.	Mean of all the Lowest.	Mean Daily Range.	Mean Temperature.	Mean of Dry Bulb.	Mean of Wet Bulb.	No. of Days on which Rain fell.	Amount.	Greatest Fall in 24 Hours.		
	Date.	Read- ing.	Date.	Read- ing.			Date.	Read- ing.	Date.	Read- ing.										Date.	Amount.	Date.
	Date.	Read- ing.	Date.	Read- ing.	Date.	Read- ing.	Date.	Read- ing.	Date.	Read- ing.	Date.	Read- ing.	Date.	Read- ing.	Date.	Read- ing.	Date.	Read- ing.	Date.	Amount.	Date.	Amount.
January, . .	11	30·338	29	29·186	1·152	29·896	31	52·6	6	9·9	42·7	40·8	38·0	38·0	7·8	38·9	37·3	36·1	21	0·720	16	0·120
February, . .	5	30·168	27	28·826	1·342	29·420	20	53·9	25	25·0	28·9	45·1	34·9	34·9	10·2	40·0	38·7	37·1	20	2·425	26	0·780
March, . .	25	30·338	15	29·262	1·076	29·912	26	66·2	19	24·0	42·2	47·4	36·3	36·3	11·1	41·8	41·3	40·2	10	0·666	1	0·275
April, . .	8	30·563	29	29·730	0·833	30·097	25	61·8	12	31·0	30·8	54·5	39·1	39·1	15·4	46·8	47·1	44·2	11	1·560	15	0·530
May, . .	8	30·494	20	29·392	1·102	29·961	15, 29	69·0	1	36·0	33·0	60·6	46·2	46·2	14·4	53·4	53·7	50·2	12	1·505	17	0·510
June, . .	8	30·336	23	29·242	1·094	29·898	19	85·8	2	41·2	44·6	66·6	50·1	50·1	16·5	53·3	53·8	54·9	9	1·925	22	0·760
July, . .	3	30·112	20	29·248	0·864	29·772	25	72·0	23	43·8	28·2	64·8	51·6	51·6	13·2	53·2	53·7	55·0	18	2·728	8	0·535
August, . .	28	30·150	21	29·008	1·142	29·784	16	82·8	28	40·8	42·0	70·0	52·9	52·9	17·1	61·4	62·0	58·4	18	2·671	19	0·505
September, .	12	30·204	29	28·820	1·384	29·435	3, 5	71·8	23	34·8	37·0	61·3	46·1	46·1	15·2	53·7	55·0	51·4	18	1·960	28	0·840
October, . .	23	30·294	4	28·917	1·377	29·680	16	63·4	31	26·0	37·4	55·2	41·5	41·5	13·7	48·3	48·4	46·4	14	2·710	7	0·960
November, .	21	30·461	17	28·485	1·976	29·995	29	55·0	21, 22	28·2	26·8	45·1	34·7	34·7	10·4	39·9	40·1	38·3	15	1·525	3	0·810
December, .	29	30·500	8	28·514	1·986	29·638	16	53·8	2	21·5	32·3	45·9	35·4	35·4	10·5	40·6	41·1	39·6	20	2·445	24	0·580
For Year, . .	Apr. 8	30·568	Nov. 17	28·435	2·063	29·795	June 19	85·8	Jan. 6	9·9	75·9	54·8	41·8	41·8	12·9	48·3	48·6	46·0	186	22·880	Oct. 7	0·960

A. D. RICHARDSON, } Observers.
A. ANDERSON, }

III. NOTES ON METEOROLOGICAL OBSERVATIONS MADE AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING 1893.

PRESSURE.

The mean atmospheric pressure at 9 a.m. (29·795 inches) was 0·007 inch above the average of the two previous years (29·788 inches).

TEMPERATURE.

The highest registered (85°·8, on the afternoon of 18th June) was 5°·2 above the highest in 1892 (80°·6), and 6°·1 above the highest in 1891 (79°·7).

The lowest registered (9°·9, on the morning of 6th January) was 1°·5 above the lowest in 1892 (8°·4), and 7°·9 below the lowest in 1891 (17°·8).

The range for the year (75°·9) was 3°·7 greater than that for 1892 (72°·2), 14°·0 greater than that for 1891 (61°·9), and 8°·9 greater than the average of these two years (67°·0).

The mean of all the highest (54°·8) was 2°·5 higher than the average of the two previous years (52°·3).

The mean of all the lowest (41°·8) was 2°·3 higher than the average of the two previous years (39°·5).

The mean of the year (48°·3) was 2°·4 higher than the average of the two previous years (45°·9).

August was the warmest month (mean 61°·4); January the coldest (mean 36°·9).

Frost was registered at four feet above the ground on 57 days during the year.

RAINFALL.

The number of days on which rain fell (186) was 27 less than in 1892 (213), and 21 less than in 1891 (207). The total fall (22·830 inches) was 0·689 inch below that of 1892 (23·519 inches), 2·457 inches below that of 1891 (25·287 inches), and 1·573 inch below the average of these two years (24·403 inches).

March was the driest month (0·666 inch); July the wettest (2·728 inches).

A. D. RICHARDSON,
Observer.

IV. ON PLANTS IN THE PLANT HOUSES, WITH EXHIBITION OF SPECIMENS. By R. L. HARROW.

Since the last meeting of the Botanical Society in December up to the present date, very few plants have produced their flowers in the houses of the Royal Botanic Garden, and, indeed, this period is probably the least floriferous of the whole year, alike amongst the occupants of tropical and sub-tropical houses.

In the Palm House, *Brownea coccinea*, Jacq., an old inhabitant of these gardens, has produced its lovely inflorescences of scarlet flowers. These are both terminal, and also produced upon the older parts of its stem and branches. When first visible they appear like leaf buds, gradually swelling into a large globular inflorescence, covered by lightish-coloured scales. The flowers are short-lived, lasting for not more than two days in perfection. The leaves, which are abruptly pinnate, bear from three to six pairs of leaflets. The figure in the "Botanical Magazine," t. 3964, was drawn from a specimen received from these gardens in 1842; and although it had been introduced some years previously, this was the first record of its flowering. The plant was said at the time to be 10 feet in height; our plant in the Palm House is now about 20 feet high. It is a native of Venezuela.

Angraecum sesquipedale, Thouars. This, now a fairly common plant in our orchid houses, is a native of Madagascar, and was first discovered by Du Petit Thouars about the end of the last century, but it was not until 1822, when his history of the plants of Madagascar was published, that it became generally known. For the introduction of living specimens credit is due to the Rev. W. Ellis, who on his return from a visit to that country in 1855 brought, amongst other species of *Angraecum*, three plants of this, the largest of the genus, one of which flowered in the spring of 1857. Owing to the difficulties encountered in transmission to Europe, subsequent attempts to reintroduce it for some time failed; but with increased facilities in this respect, large importations have been made by several orchid dealers. The waxy appearance of its sepals and petals, combined with

its long spur, have long been a source of attraction. The late Mr. Charles Darwin, upon asking himself the use of this long spur, which performs the office of a nectary, came to the conclusion that the fertilisation of the flower depended upon its length, as the nectar was only found at the lower extremity; and prognosticated the existence in Madagascar of moths with probosces, capable of extending the length of 10 or 11 inches. In his book on the Fertilisation of Orchids, he says:—"If the *Angraecum* in its native forests secretes more nectar than the vigorous plants in our hothouses, so that the nectary becomes filled, small moths might obtain their share, but they would not benefit the plant. The pollinia would not be withdrawn till some huge moth with a wonderful proboscis tried to drain the last drop. If such great moths were to become extinct in Madagascar, assuredly the *Angraecum* would become extinct also. On the other hand, as the nectar, at least in the lower part of the nectary (spur), is stored safe from depredation by other insects, the extinction of the *Angraecum* would probably be a serious loss to these moths." At the time no moth with this character was known, but since that date they have been, I believe, found in the island. The flower has a powerful odour at night, whereas by day it is quite scentless.

Thunbergia laurifolia, Lindl. This is a beautiful winter flowering tropical climbing plant, belonging to the order Acanthaceæ. It was described by Dr. Lindley in 1856. The plant is a vigorous grower, resembling in the colour of its flowers, to a certain extent, *T. grandiflora*, but differing in its foliage, the species under notice having elliptic, acuminate leaves, and quite glabrous, whilst those of *T. grandiflora* are pubescent. Its racemes are produced laterally from the stronger growths, and sometimes carry as many as a dozen of the beautiful ultramarine blue flowers. About the nodes there are a large number of secretory glands. Mr. W. Gardiner, M.A., F.R.S., in a paper read before the Cambridge Philosophical Society, states that the secretion serves to attract ants, which, besides feeding upon them, also protect the thin young climbing shoots by attacking and destroying other creeping insects of alien races with whom they may meet in their passage up and down the stem.

Barnadesia rosea, Lindl. This plant is a native of South America, the exact locality being at present unknown, but the plant is supposed to be spread over a wide area of the Continent. Its flower heads are produced upon the apex of a branch during the winter and spring months; the florets are of a bright rose colour, the base of the inflorescence being covered by silvery, scaly bracts. The alternate leaves, of an ovate shape, are of a bright green colour. It is figured in "Botanical Magazine," 4232. An interesting feature of the flower heads is the hardening and recurving of the calyx bristles as the fruit ripens. As they bend backwards, these act as springs for gradually drawing out the fruit from within the tubular involucre, and expelling them for distribution. When scattered, these bristles, which are hygroscopic, will no doubt aid further in disseminating the fruit by hooking on to passing animals and by fixing the fruits on a suitable nidus for growth.

Abutilon insigne, Planch. Introduced from New Grenada by Mr. Linden in 1851, this plant is still seldom met with. It is a slight-growing, shrub-like plant, producing its flowers, which hang in a drooping manner, about the beginning of the year. The petals have a ground colour of white, and are thickly penetrated by a rich carmine venation. The stem and the under side of the large alternate leaves are covered by short brown hairs. This plant is sometimes known as *A. igneum*.

Strobilanthes Dyerianus, Hort. This beautifully variegated foliage plant was recently introduced, being sent out by Messrs. Sander & Co., of St. Alban's. Although usually grown as a decorative stove plant, on account of its coloured leaves, it also bears pretty blue flowers, as the specimen on the table shows.

In addition to these, specimens are exhibited of: *Billbergia Bruantii*,—a pretty bromeliad, with large red bracts. *Calliandra hæmatocephala*, Hassk.,—a leguminous stove plant, bearing stalked globose heads of flowers, with long numerous stamens of a lovely scarlet colour, sent to Kew from Mauritius in 1857. *Pithecolobium unguis-cata* (*Inga rosea*, Steud.), much similar to the above, but with inflorescences smaller and pinnæ of leaflets more numerous and bipinnate.

MEETING OF THE SOCIETY,

Thursday, February 8, 1894.

Dr. WILLIAM CRAIG, Vice-President, in the Chair.

Lady HENRY GROSVENOR and R. C. MUNRO FERGUSON, Esq., M.P., were elected Resident Fellows of the Society.

The death of Sir THOMAS BUCHAN-HEPBURN, Bart., of Prestonkirk, Non-Resident Fellow of the Society was intimated.

Mr. WILLIAM SANDERSON exhibited a plant in flower of *Masdevallia* sp.

Mr. CAMPBELL sent cut flowers of *Daphne Mezereum*, *Anemone Hepatica*, *Erica carnea*, *Leucojum*, etc., from his garden at Ledaig, Argyllshire.

Professor BAYLEY BALFOUR exhibited a series of new diagrams, by Professor Dodel Port, illustrating the life-history of *Iris*.

Mr. M'GLASHAN exhibited a portrait of the late Dr. Richard Spruce.

The following papers were read:—

OBITUARY NOTICE OF RICHARD SPRUCE, Ph.D By G. STABLER.

Dr. Richard Spruce, the distinguished traveller and botanist, died of influenza at Coneysthorpe, near York, on 28th December 1893, at the age of seventy-six years. He was born at Ganthorpe, near the same place, on 10th

September 1817, and was the son of Richard Spruce the highly esteemed and efficient schoolmaster at Ganthorpe, and afterwards at the neighbouring village of Welburn. His mother's maiden name was Etty, a relative of William Etty the eminent artist and Royal Academician.

At Ganthorpe he spent his early life, and when quite a child he showed great aptitude for learning, and at an early age developed a great love of nature. Amongst his earliest amusements was the making of lists of plants, and he had also a great liking for astronomy, which was of use to him in after years. He commenced the study of classics with an old schoolmaster of the name of Langdale, who had originally been designed for the priesthood, and whose scholarship his distinguished pupil always spoke of most highly. When a little older he became a tutor for a short time in a private school at Haxby, near York, and about the beginning of 1840, was mathematical master at the York Collegiate School, which position he filled for five years.

To trace his botanical career it will be necessary to go back a little. The writer of this memoir possesses a neatly written manuscript list, made by Spruce and dated April 1834, of plants found by him mostly within a short radius of Ganthorpe. It comprises 403 species alphabetically arranged. The first page contains a list of abbreviations used in giving localities to the plants, and on the last page is a tabulated summary. This was drawn up when he was sixteen years of age, and most of the records must have been made before he was sixteen. Three years later he drew up the "List of the Flora of the Malton District," the manuscript of which is now in the hands of Mr. M. B. Slater. In it are enumerated 485 species arranged alphabetically, with habitats

The next stage in his botanical career was the commencement of his study of mosses and hepaticæ, which dates from the time he went to York in 1840. For a time, whilst at York, he applied himself severely to the special study of mathematics, and some of his friends suggested that he should enter the church, but he preferred to become "a priest of science," as the great Von Martius, his "very attached friend and admirer," designated him in

after years. During one of his summer vacations, when passing over Slingsby Moor, not far from his native place, he met with one of the uncinatè *Hypna* in splendid fruit. His love of plants, from which he had been partially weaned for a short time by his mathematical studies, returned with such force, that he vowed on the spot that henceforth the study of plants should be the great object of his life. Hitherto he seems to have been a lover, now he becomes wedded to his favourite science.

For four years, January 1841 to December 1844, his journals show that he took every opportunity to explore the district surrounding the city of York, and especially the extensive unenclosed commons; and in his vacations to take more extended and distant rambles. In June 1841 he spent some days in the North York Moors, and in December of that year he went into Wharfedale. In the summer of 1842 he visited Dr. Thomas Taylor at Dunkerron, in the west of Ireland, and botanised in that rich district for about a month, and at Christmas spent some days collecting in Eskdale and other valleys near Whitby. In the months of June and July of 1843 he made a three weeks' expedition to Teesdale, which formed the subject of an excellent paper to the Botanical Society of Edinburgh, opening out for the first time the great richness of the flora of that valley, on which occasion he discovered *Amblystegium Sprucei*, Bruch. In December of that year he went to Forge Valley and other places in the neighbourhood of Scarboro'. Once more, in the summer of 1844 he spent ten days in Derbyshire. In the three years and a half mentioned he made fully one hundred botanical excursions, some of which we have seen extended over several days.

On 1st May 1845 he left England for the Pyrenees, going and returning by Paris, where he met Dufour. He did not return until the 10th of April 1846. His stay in the Pyrenees enabled him to secure a rich harvest of mosses and hepaticæ, and these plants were the subject of a second and more important paper communicated to the Edinburgh Botanical Society.

The next important step in the life of Dr. Spruce was his determination to explore the Amazon and some of its

affluents. After working up and disposing of his Pyrenean plants, he prepared himself for future work by studying exotic plants at Kew and the British Museum. In the latter place he met Robert Brown, for whom he had the highest esteem as a botanist, and whose descriptions of plants he considered as models. Having mentioned Robert Brown, it would perhaps not be out of place to say that at this time Dr. Spruce numbered among his correspondents Dr. Montagne (one of Napoleon's army surgeons in Egypt), Dufour, Bruch, Schimper, Gottsche, Sullivant, W. J. Hooker, Bentham, Greville, Taylor, Borrer, Wilson, Leighton, Babington, Hanbury, Mitten, etc.

In his early manhood Dr. Spruce, who was never robust, was considered by some to be consumptive. He was offered a position on board one of the ships of a Franklin Search Expedition. This he declined, preferring the climate of South America.

Having by this time, by sheer merit, attracted the attention and esteem of botanical authorities, he received, amongst others, commissions from Kew; and on the 7th of June 1849 embarked for America, and arrived at Pará on 13th July. This is not the place to give a detailed account of his travels and work in South America. In 1886, in the "*Revue Bryologique*," he gave a brief and most interesting *précis* of his travels, written in French, and entitled "*Voyage de R. Spruce dans Amérique Equatoriale pendant 1849-1864*." Sir Roderick Murchison, in 1864, then President of the Royal Geographical Society, briefly summarised his geographical work thus:—"I have pleasure in announcing that the indefatigable explorer Mr. R. Spruce, who has for fifteen years been unceasingly employed in scientific labours in the valley of the River Amazon and in the Andes of Ecuador, is on his way to England. Of his great services to botany it is not for me to speak, but his geographical work is entitled to special thanks at my hands. Mr. Spruce left England in the year 1849, and landed at Pará, whence he proceeded up the River Amazon and explored several of its least-known affluents. In 1849 he ascended and made a map of the River Tombetas, an important tributary of the Amazon, which was hitherto unsurveyed. In 1853 and 1854 he

ascended the Rio Negro, Cassiquiari, and Orinoco; exploring and mapping the River Cunucunúma, a tributary of the Orinoco, and the River Pacimoni, which flows into the Cassiquiari. The maps of these three rivers were made by means of cross-bearings and astronomical observations, and will form an important addition to geographical knowledge. During the years 1855 and 1856, Mr. Spruce ascended the River Huallaga, and in 1857 he successfully surmounted all the difficulties of the navigation of the Rivers Pastasa and Bombonasa, and reached the Andes of Quito. He has since been engaged in exploring the southern part of the republic of Ecuador, and during 1860 he was employed by the Secretary of State for India, in co-operation with Mr. Clements Markham, in collecting chinchona plants and seeds in the forests at the foot of the mountain of Chimborazo. After fifteen years of such incessant toil in the cause of science, exposed to innumerable dangers and privations, the health of Mr. Spruce has been much impaired. . . ."

In consideration of this work Dr. Spruce was elected an Honorary Fellow of the Royal Geographical Society in 1866.

An equally authoritative summary of his botanical work was given by Mr. Bentham, President of the Linnean Society, who worked up and distributed his Phanerogams, as follows:—"His researches into the vegetation of the interior of South America have been the most important we have had since the days of Humboldt, not merely for the number of species which he has collected (amounting to upwards of 7000), but also for the number of new generic forms with which he has enriched science; for his investigation into the economic uses of the plants of the countries he visited; for several doubtful questions of origin as to interesting genera and species which his discoveries have cleared up; and for the number and scientific value of his observations, made on the spot, attached to the specimens preserved, all which specimens have been transmitted to this country, and complete sets deposited in the National Herbarium at Kew."

It was whilst preparing to enter the forests of red-bark (*Cinchona succirubra*), at the west foot of Chimborazo, that

his health began to give way. Under date 24th April 1860, he writes: "Woke up this morning paralysed in my back and legs. From that day forth I was never more able to sit straight up or walk about without great pain and discomfort." In September of next year (1861) another misfortune befell him owing to the failure of a mercantile house in Guayaquil, by which he lost 6000 dollars, and thus was brought almost to destitution. He was now under the necessity of selling his most valuable and, to him, most precious books, which realised about 300 dollars. After spending two years on the coast of Ecuador, and sixteen months on the coast of Peru, and finding it impossible to work, he determined to return to England. He landed at Southampton on the 27th of May 1864.

In addition to the results before mentioned, he gave considerable attention to the Ethnography of the districts through which he passed, and drew up twenty-one Indian vocabularies.

After his arrival in England he remained in London for a short time, and then removed to Hurstpierpoint, where he superintended the arrangement and distribution of his South American mosses. This collection, originally intended to be worked up by himself, was undertaken by Mr. Mitten, and we can hardly open a page of Mitten's important work, "*Musci Austro-Americani*," without noticing plants gathered by Spruce. In 1867 he settled down in lodgings at Welburn. After his arrival in Yorkshire his health was very indifferent. Here he remained nine years, during the early part of which he was unable to do much work. In 1867 he writes: "I can hardly write in any other way than reclining in my easy chair with a large book across my knee by way of table, and consequently I rarely write anything but what is absolutely necessary." In January 1869 he says: "I fear I must henceforth shut my eyes to cryptogams; I have packed the microscope away lest I should enter into temptation;" and in October of the same year, "I have made two attempts to complete my monograph of the South American *Plagiophilæ*, but the sitting up to the microscope has brought on bleeding of the intestines to such an extent that I fear I must renounce the task altogether, to my deep

regret. I have not looked through the microscope for many weeks."

On 11th May 1871 he wrote: "It has been very hard times with me all this year. Nevertheless, I lately plucked up courage to disinter my microscope, after it had been out of sight full eighteen months, and I have gone thoroughly over all my South American *Plagiochilas*, have described all the forms, and have made up my mind as far as possible about the 'species.' The result has been to make me more Darwinian than ever."

During the last nine years he was at Welburn, and in this broken-down state of health he examined all his South American palms, and the result appeared in his "*Palmae Amazonicae*," a *brochure* of nearly 200 pages, in which are described 118 species, more than half of which are new to science. The first portion of his "*Hepaticae Amazonicae et Andinae*" was written at Welburn and completed at Coneythorpe, where he lived for the last seventeen years of his life. The "*Hepaticae Amazonicae et Andinae*," a book of nearly 600 pages, contains elaborate descriptions in Latin of upwards of 700 species and varieties, two-thirds of which were new to science. This may be said to be by far the most important of his numerous works, from a purely scientific point of view; and as a proof of its merits, leading hepaticologists of other countries have adopted to a large extent the classification of an "*illustré et vénééré maître*." It has been spoken of as one of the remarkable books of this century; and it is a work the publication of which justifies the existence of such bodies as the Botanical Society of Edinburgh. After its completion he had a slight apoplectic seizure. For about two months he never once used the microscope, and, to use his own words, "for the shortest letter I had to avail myself of an *amanuensis*. I knew exactly what I wanted to write, but my hand refused to write it. I am now writing almost *à mon ordinaire*, but I cannot write much at a time."

It has been observed that through misfortune he was in straitened circumstances when he arrived in England. This, in combination with the state of his health, induced his friend, Mr. Clements Markham, to make representations to the English Government with the view of

procuring a pension for him, which at first was refused; and it was not until the seventh Earl of Carlisle used his influence that he was granted in 1865, by Lord Palmerston, a pension of £50 a year. In 1877, through Mr. Markham's further entreaties, he secured for his fellow-pioneer "of the greatest achievement of this century in the domain of practical economic culture of medicinal plants" a further pension of £50 from the Indian Government. These sums, awarded for past services, may be said to have afterwards been used as "endowment of research," for, except when prevented by illness, the recipient was altogether engaged in purely unremunerative scientific work up to the time of his last short illness.

Many years ago he was in communication with Mr. John Murray with respect to an account of his travels, part of which is in manuscript, but incomplete. It was his intention also to supplement his "*Hepaticæ Amazonicæ et Andinæ*" with another work on geographical distribution and other matters, which would have been as large as its predecessor. This is about half done.

Having had the honour and privilege of being on terms of intimate friendship with Dr. Spruce for over a quarter of a century, I may be allowed to offer a few observations of a more personal nature. The treatment of his friends carried out the advice he gave to others, in the words of old Polonius:—

"The friends thou hast and their adoption tried,
Grapple them to thy heart with hooks of steel."

When young he was tall and spare, with dark hair. In his latter days his beard and hair were grey, the latter rather long. In his room everything was in the strictest order, and Mr. A. R. Wallace, who met with him and remained with him for some time in the basin of the Amazon, remarks that he was equally orderly when he was exploring the virgin forests of that district. He was also one of the most methodical of men. In his botanical work he seems to have thought that if anything was worth noticing it was worth recording. He seems never to have examined and noticed anything without making a note of it, and in his later years he would readily turn to notes, all carefully numbered, on plants which he had made in

his early days, and rely on his conclusions with as much certainty as if they had been made on the previous day. All his work was well and thoroughly done. At the same time he worked quickly. He was also very systematic in the time for working. For many years all his writing was done with black lead pencil, reclining on a couch with the paper on a board. Dr. Spruce had considerable aptitude for learning languages. He spoke and wrote French, Spanish, and Portuguese. He was widely read in general literature, and a copy of Shakespeare's Works was one of his companions in crossing the Continent of South America. He was always courteous and gentlemanly in his bearing, and ever affectionate, kind, and sympathising as a friend. He had a considerable vein of humour in his nature, and could relish and tell an amusing story or make a good pun. As an hepaticologist he might justly be placed in the foremost rank, and this being the case he was in communication, previous to his death, with nearly every hepaticologist of note in the world. He understood the theory of music, and was naturally very musical, possessing a true ear and a good voice.

He was never married; he died from an attack of influenza, which his already weakened body could not overcome. He was interred on the last day of the year 1893 at Terrington, beside his father and mother, in accordance with directions given several years before his death to Mr. M. B. Slater, of Malton, his sole executor.

LIST OF PAPERS, ETC., BY DR. RICHARD SPRUCE.

1. A List of Mosses and Hepaticæ collected in Eekdale, Yorkshire.—*Phytologist*, i., 540–544 (1844).
2. On the Branch-bearing Leaves of *Jungermannia juniperina*, Sw.—*Phytologist*, ii., 85, 86 (1845).
3. A List of Musci and Hepaticæ of Yorkshire.—*Phytologist* ii., 147–157 (1845).
4. The Musci and Hepaticæ of Teesdale.—*Trans. Bot. Soc. Edin.*, ii., 65–89 (1846).
5. The Musci and Hepaticæ of the Pyrenees.—*Annals and Magazine of Nat. History*, 2nd series, iii., 81–106, 269–293, 358–380, 478–503; iv., 104–120, t. i.–iii. (1849). *Trans. Bot. Soc. Edin.*, 103–216, t. i., ii., xiv. (1850).
6. On *Anomoclada*, a new Genus of Hepaticæ, and its allies, *Odontoschisma* and *Adelanthus*.—*Jour. of Bot.*, xix., 33–40 (1881).

7. On *Marsupella Stableri* (n. sp.) and some Allied Species of European Hepaticæ.—Revue Bryologique, viii., 89–104 (1881).
8. On Cephalozia, its Sub-genera and some Allied Genera.—8vo, pp. 99 (Malton, 1882).
9. Hepaticæ Amazonicæ et Andinæ.—Trans. Bot. Soc. Edin., xv., 1–590, t. i.–xxii. (1885).
10. *Lejeunea Holtii*, a new Hepatic from Killarney.—Jour. of Bot., xxv., 33–39, 72–82, t. cclxxii. (1887).
11. On a new Irish Hepatic (*Radula Holtii*).—Jour. of Bot., xxv., 209–211 (1887).
12. Hepaticæ in Provincia Rio Janeiro a Glazion lectæ.—Revue Bryologique, xv., 33–34 (1888). (List only.)
13. Hepaticæ Paraguayensis, Balansa lectæ.—Revue Bryologique, xxv., 34–35 (1888). (List only.)
14. *Lejeunea Rossettiana*, Mass.—Jour. of Bot., xxvii., 337, 338 (1889).
15. Hepaticæ Bolivianæ, in Andibus Bolivie Orientalis, annis 1885–6. A cl. H. H. Rusby lectæ.—Mem. Torrey Bot. Club, i., 113–140 (1890).
16. Hepaticæ Novæ Americanæ, tropicæ et aliæ.—Bull. Soc. Bot. de France, xxxvi., cxxxix.–ccvi. (1889).
17. Hepaticæ Spruceanæ. Amazonicæ et Andinæ, annis 1849–1860 lectæ.—(Malton, 1892). (Specimens.)
18. Beschereille et Spruce.—Hepatiques nouvelles de Colonies Françaises.—Bull. de la Soc. Bot. de France, xxxvi., clxxvi.–clxxxix., pl. xiii.–xvii. (1889). (New species from Guadeloupe, French Guiana, New Caledonia, and Reunion Island.)
19. On several Mosses new to the British Flora.—London Jour. of Bot., vol. iv. (April 1845).
20. Notes on the Botany of the Pyrenees, in a letter addressed to the editor of Sir W. J. Hooker's London Journal of Botany, dated 3rd Jan. 1846, Bagnères de Bigorre, Hautes Pyrénées, and 1846 (England).
21. On the Mode of Branching of some Amazonian Trees. By Richard Spruce. (Written from) Ambato, near Quito, 25th May 1859.—Jour. of the Proceedings of the Linnean Soc., vol. v., p. 14.
22. On Five New Plants from Eastern Peru. By R. Spruce.—Jour. of the Proceedings of the Linn. Soc. (April 1859).
23. Mosses of the Amazon and Andes. By Richard Spruce.—Jour. of the Proceedings of the Linn. Soc. Bot., vol. v. (An *Andrexa*, an *Acroschisma*, and three *Taylorias*—all new except *T. erythrodonia*).
24. Notes on Papayaceæ. By Joaquim Correa de Mello and Richard Spruce. Signed R. S., 3rd Jan. 1867. pp. 15. Linn. Soc. Jour. of Bot., vol. x.
25. Notes on some Insect and other Migrations observed in Equatorial America. By Richard Spruce.—Linn. Soc. Jour. (Zoology), vol. iv.
26. Catalogus Muscorum fere omnium quos in Terris Amazonicis et Andinis, per annos 1849–1860, legit R. Spruce. Londini, 1867, p. 22. Extends to No. 1518.
27. Notes on the Valleys of Piura and Chira, in Northern Peru, and on the Cultivation of Cotton therein. By R. Spruce.—London: for Her Majesty's Stationery Office, 1864. p. 81.

28. Voyage de R. Spruce dans Amerique Equitoriale, pendant 1849-1864.—Revue Bryologique, No. 4, 1886.
29. Musci Præteriti. By R. Spruce.—Jour. of Bot., Dec. 1880, No. 216, and Feb. 1881, No. 218.
30. Ant Agency in Plant Structure. By R. Spruce. Communicated to the Linn. Soc. by Charles Darwin.
31. The Morphology of the Leaf of Fissidens. By R. Spruce.—Jour. of Bot., No. 220 (April 1881).
32. List of the Flora of the Malton District, 1837. By R. Spruce.—(It is in MS. I doubt it being published.)
33. Personal Experiences of Venomous Reptiles and Insects in South America. By R. Spruce.
34. On some Remarkable Narcotics of the Amazon Valley and Orinoco. by R. Spruce.
Note.—Nos. 33 and 34—MSS. in G. Stabler's possession. Do not know where they were published.
35. Report on the Expedition to procure Seeds and Plants of the *Chinchona succirubra*, Pavon., or Red-Bark Tree. R. Spruce.—(Eyre & Spottiswood, I think.)
36. Extracts from Letters from R. Spruce, written during Botanical Explorations on the Amazon, in Hooker's Journal of Botany:—For May 1851, Nov. 1851, Oct. 1852, Nov. 1852, July 1853, Aug. 1853, Feb. 1854, April 1854.
37. Palmæ Amazonicæ, sive enumeratio Palmarum in itinere suo per regiones Americæ Equatoriales lectarum. 183 pp. Auctore, Ricardo Spruce, Ph.D., F.R.G.S.—Linnean Society's Journal (Botany), vol. xi.

NOTE ON *ANGRÆCUM SESQUIPEDULE*, THOUARS. By
WILLIAM SANDERSON.

This Orchid is a native of Madagascar, and was introduced into this country by the Rev. W. Ellis. Though by no means a rare plant, it is one not commonly met with in average collections, as it is rather difficult to grow unless in a suitable situation.

The photograph which you see is of a plant which I acquired in February 1887: it was an imported piece, and had then only four or five leaves; it first flowered in my garden at Talbot House, Ferry Road, February 1888, and has continued to flower annually ever since, the number of blooms being usually from six to eight; this season it has surpassed itself, and carried eight spikes, six of two blooms each, and two of three blooms each, in all eighteen flowers, all perfect and all expanded at the same time.

I am indebted to Professor Bayley Balfour for some information regarding plants with many flowers which have been recorded previously. In 1890 a plant at Messrs. Seeger & Tropp's nursery, East Dulwich, had ten blooms (Gard. Chron., 3rd series, vii., 1890, p. 11); in 1873, in the garden of Mr. W. Terry, Peterbrough House, Fulham, a plant showed twelve blooms (Gard. Chron., 1873, p. 254, fig. 53); at Davenham in 1892 a plant bore thirteen flowers (Gard. Chron., 3rd series, xi., 1892, p. 84); in 1874, in the garden of Mr. R. Miln, Arbroath, a plant had seventeen flowers (Gard. Chron., 1874, p. 346, fig. 79). The figure of Mr. Miln's plant shows it to have had a single stem, and this presumably was the character of all the other plants referred to, as it is of my plant. A plant is also noticed (Gard. Chron., 3rd series, xii., 1892, p. 123) from the garden of Mr. A. S. Kimball, Rochester, New York, which had twenty-three flowers in July, the period of flowering in this country being from December to March. But from Ferguslie, Paisley, a plant is recorded in Gard. Chron., 2nd series, xxv., 1886, p. 170, with five growths 2-3 feet high, bearing thirteen spikes with thirty-six flowers, of which twenty-four were expanded. He adds that so far as he can learn my plant is the one with the greatest number of flowers on a single stem that has been recorded in Britain.

While in its native country this orchid is found growing on trees, this plant has been grown in a pot filled with alternate layers of crocks and sphagnum, close to the back wall of a house, along with Vandas, Dendrobiums, Cypripediums, etc. It is a plant of slow growth, making only a single pair of leaves annually, it seems to enjoy sunshine and a fair amount of water, but it must have efficient drainage.

SCOTTISH UTRICULARIAS. By Rev. E. F. LINTON.

The following notes are submitted for the purpose of directing the attention of botanists who have opportunities of visiting the localities mentioned, or other places where species of *Utricularia* may be found, to some difficulties in

the way of determination of the species, and in the hope that they may be willing to co-operate in their elucidation.

Utricularia Bremii, Heer., has often been suspected, but its existence in Britain is still, I believe, not absolutely proved (but see a valuable paper on this in Jour. Bot., 1876, 142, etc.).

Differences from *U. minor*, L., to be looked for are—(1) robuster habit, (2) a more decided spur, which in *U. minor* is scarcely longer than broad, and (3) an orbicular lower lip.

Some suspected localities are “Moss of Inshoch, Nairn, and Loch of Spynie”—Bab. Man., ed. viii., 288. The Loch of Spynie is near Elgin. “Near Glenluce”—on a label, Hb. Edinb. B. G. Culdoch Moor, Kirkcudbright. Loch Feoir, Assynt. Mr. F. M. Webb (*l.c.*) considered the Loch of Spynie plant to be *U. Bremii*, and “certainly not *U. minor*.”

In the Loch of Spynie a slender form of *U. vulgaris*, L., should be looked for, and observed while fresh. The specimen in Hb. Edinb. B. G. does not look typical.

An interesting species has been gathered on Gordon Moss by Prof. Dickson in 1882, allied to *U. neglecta*, Lehm., and possibly a form of that species, which deserves study. There are three sheets in Herb. Edinb. B. G., beautifully preserved, but unfortunately flowerless.

A plant somewhat similar to the one from Gordon Moss has been sent me (by the Rev. E. S. Marshall, and may be rightly named) as *U. neglecta*, from peaty bogs of Loch Gannich, Rannoch Muir, Argyll. No flowers.

Long Moss, near Faldonside, Selkirkshire, produces a plant which is probably *U. neglecta*, but I have only seen flowerless specimens.

The difficulty in determining the species of this genus usually arises from the absence of flowers, or their poor state of preservation when present. They are frequently flowerless in rainy districts; while, on the other hand, the season of 1893 has given me abundant proof that a warm, dry season favours the production of flowers. Having a suitable locality for their development near at hand—a shallow bog with a sunny exposure—I am willing to try and persuade to flower any critical or curious unnamed

forms which usually are flowerless in their native stations that may be sent me. They are most easily transplanted in the winter-bud condition, when they may be posted either in a small bottle or tube of water, or in wet rag secured from evaporation; but, with care in the supply of moisture, they will probably bear transplantation at any season.

CONTRIBUTIONS TOWARDS A FLORA OF WEST ROSS. By G. CLARIDGE DRUCE, M.A., F.L.S.

The first notice which I am acquainted with of any plants occurring in the vice-county of West Ross (No. 105 of Watson's "Topographical Botany") is to be found in the two volumes of Lightfoot's "Flora Scotica," which is dated 1777. The Ross-shire plants mentioned in it, which appear to belong to the western watershed, are as follows:—*Circea alpina*, *Cynosurus cœruleus* (*Sesleria cœrulea*), *Chenopodium maritimum* (*Sueda maritima*), *Cornus suecica*, *Vaccinium uliginosum*, *Juncus trifidus*, *Epilobium alpinum*, *Arbutus alpina* (*Arctostaphylos alpina*), *Pyrola minor*, *P. secunda*, *Satyrion repens* (*Goodyera repens*), *Ophrys cordata*, (*Listera cordata*), *Ophrys corallorhiza* (*Corallorhiza innata*), *Dryas octopetala*, *Draba incana*, *Asplenium viride*, *Polypodium Lonchitis* (*Polystichum Lonchitis*), *Hieracium alpinum*, *Tanacetum vulgare*, *Sparganium natans*, *Poa maritima* (*Glyceria maritima*), *Pinus sylvestris*, *Trichomanes tunbridgensis* (*Hymenophyllum unilaterale*), *Osmunda Lunaria* (*Botrychium Lunaria*). *Betula nana* is given as growing on the moors of Loch Glass, but these I believe drain into the Eastern Sea. Of the foregoing plants the exact identity of *Sparganium natans*, and *Hieracium alpinum* is doubtful. Up to the present time, so far as I am aware, *Sesleria*, *Goodyera*, and *Corallorhiza* have not since been found, they probably will be rediscovered.

In "English Botany," 1809, *Stachys ambigua* is reported on the authority of W. Borrer and W. J. Hooker from the side of Loch Carron. The plate in "English Botany" is numbered 2089.

In Hooker's "Flora Scotica," 1821, we have two additional

species put on record, *i.e.* *Hypericum Androsæmum*, Loch Maree, G. Anderson [*Lycopus europæus*, margin of Loch Aichaltie, near Craigdarroch (W. Stables), is in East Ross], and *Pinguicula lusitanica*. The station for *Stachys ambigua* is given more precisely "near Jeantown," where it still occurs.

In the "New Botanists' Guide," 1835, a considerable number of plants from Ross are given, principally on the authority of Mr. G. Gordon. Most of the unlocalised ones were subsequently placed in the vice-county of East Ross by Mr. H. C. Watson. *Orobanche rubra* is an addition to the West Ross flora; it was found on a small island not far from the mainland, Gairloch, by R. B. Bowman.

In Murray's "Northern Flora," 1836, several plants are mentioned as growing in Ross-shire, but as they are unlocalised they cannot be precisely placed in either division of the county. These include *Veronica scutellata*, *Eriophorum angustifolium*, *Triodia*, *Knautia arvensis*, *Galium boreale*, *Alchemilla alpina*, *Azalea procumbens*, *Hedera Helix*, etc. Mr. Watson subsequently placed most of them to East Ross.

In Gordon's "Collectanea for a Flora of Moray, 1839." *Scirpus maritimus* is noted from Kintail, and *Eriophorum pubescens* from Plockton (Mr. Stables), which are additions. *Saussurea alpina* and *Cryptogramme crispa* are recorded in the same work by Mr. G. C. Smith from Ben-lea-mohr-guislee, which Mr. Arthur Bennett suggested might be Bienn Liath Mohr in Strathcarron, *i.e.* in West Ross. Mr. W. Douglas suggests with greater probability that by this name was intended Bienn Liath Mohr a Ghuibhais Li (2464 feet), which lies about six miles north of Loch Luichart station, *i.e.* in East Ross.

In the "Geographical Distribution of British Plants," the author, H. C. Watson, records a few plants, such as *Ranunculus Ficaria*, *R. Flammula*, and *Nymphaea alba* for Ross, but these again cannot be precisely put to the western portion of the county.

Anderson, in "The Guide to the Highlands and Islands of Scotland," mentions that *Atropa Belladonna* grows in the churchyard of Gairloch, where, of course, it was not a native plant.

In the "Phytologist," vol. i, p. 147, 1842, *Lycopodium annotinum* is said to have been gathered by Mr. G. C. Smith in West Ross, and given to Mr. Stables.

Some time prior to 1873, Professor Churchill Babington visited the county, and recorded the discovery of *Rubus Chamæmorus*, *Rosa spinosissima*, *Antennaria dioica*, *Oniscus heterophyllus*, *Hieracium anglicum*, *Utricularia intermedia*, *Juncus triglumis*, *Rhynchospora alba*, *Avena pubescens*, *Galeopsis versicolor*, and *Schænus nigricans*.

In the first edition of "Topographical Botany," published 1873-74, Mr. Watson includes for West Ross *Silene acaulis*, on the authority of Mr. Graham; *Alchemilla alpina* and *Salix Lapponum*, on Mr. Campbell's authority; and *Galium boreale*, recorded by Mr. G. C. Smith. In the same work sixteen species appear to be first definitely recorded for the vice-county, but they are without personal authority for their occurrence. They are as follows:—*Thalictrum alpinum*, *Subularia aquatica*, *Cherleria sedoides*, *Radiola*, *Sibbaldia*, *Vicia sylvatica*, *Saussurea*, *Lobelia Dortmanna*, *Azalea procumbens*, *Gentiana Amarella*, *Arbutus Uva-ursi*, *Salix herbacea*, *Tofieldia*, *Malaxis*, *Blysmus rufus*, and *Lycopodium inundatum*. *Betula nana* is also given, but this is probably included on the erroneous idea that Loch Glass is in West Ross. Several species recorded by Lightfoot, Churchill, Babington, and others are also included.

In the "Scotch Naturalist," vol. ii, 1873-74, pp. 74-78, Mr. Davidson commenced a paper on the Flora of Ross, but which only treated of the Phanerogams as far as the Caprifoliaceæ. This flora is not of great service to us since necessarily Mr. Watson's divisions of the county were not adopted, and the absence of precise localities prevent us from taking the authority for the occurrence of the species in the western watershed. The terms "common" or "very common" almost certainly refer to Eastern Ross. It must be borne in mind that the two divisions of the county are based on a natural separation by the watershed, east and west, so that the flora of the two divisions of the county perhaps differ more from each other than that of East Ross does from Northern Easternness, or that of West Ross does from Northern Westernness. The unlocalised records of Mr. Davidson's are therefore neglected in the following list.

The localised records (assuming that the plants are correctly named), which appear to be new to the vice-county, are *Ranunculus Lingua*, Kintail and Gairloch. (Not yet seen by me in the county. Large forms of *R. Flammula* are sometimes so named.) *Trollius europæus*, West Ross! *Corydalis claviculata*, Melvaig, by Gairloch. *Arabis petraea*, Gairloch. (Can this be correct? It is a mountain plant, but is occasionally brought down to low level by mountain streams. It occurs on hills at the head of Loch Maree.) *Draba rupestris*, Ben Sleugach. (If correctly named, an interesting record, but small forms of *D. incana* are sometimes mistaken for it.) *Lepidium Smithii* and *Drosera anglica*, Gairloch! *Hypericum calycinum*, Balmacarra (planted, of course). *Rubus corylifolius*, Glen Shiel. *Rosa involuta*, Gairloch. *Pyrus Aria*, "rare, Loch Carron." *Sedum Rhodiola*, "Baiois Bhein, Gairloch." *Sedum Telephium*, "not common, Gairloch" (a doubtful native). *S. anglicum*, "rare, Gairloch" (so far as my observation goes, it is a common plant by the coast). *Cicuta virosa*, Glen Shiel. (I saw *Enanthe crocata* there, but *Cicuta* is recorded from the Hebrides, so it may be correct.) *Heloeciadium nodiflorum*, Gairloch. *Enanthe Lachenalii*, Gairloch. *Linnaea borealis*, "in an island in Loch Maree." Neither of the last three plants have so far been observed by me in West Ross.

The foregoing records are the only ones I have been able to find that relate to West Ross, but my search has not been of an exhaustive character, and I may have overlooked some paper or work in which the subject has been dealt with.

After the publication of Mr. H. C. Watson's "Topographical Botany," in which nine counties had no list of common plants recorded, Mr. Watson asked me to visit West Ross, which was one of these, in order to compile a list of its plants. In the August of 1880 I made my first acquaintance with what proved to be really "a land of mountain and flood." I began my expedition at Achnasheen, where (as its name implies) all the winds and a good deal of the wet of heaven meet, and walked through a heavy rain to Kinlochawe, gathering *Malaxis* and noting about a hundred plants on my way. Two days were spent at

Kinlochewe in climbing the Slioch, and examining the shores of Loch Maree, but torrents of rain made the task anything but a pleasant one. The plants gathered included, *Isoetes lacustris*, *Myriophyllum alterniflorum*, *Hydrocotyle*, *Littorella*, *Lobelia Dortmanna*, *Pinguicula lusitanica*, *Nitella opaca*, *Drosera obovata*, *Carex pauciflora*, *C. Hornshuchiana*, *Equisetum sylvaticum*, *Habenaria bifolia*, *Gnaphalium sylvaticum*, *Thalictrum alpinum*, *Potentilla Sibbaldi*, *Epilobium alpinum*, *Cornus suecica*, *Juniperus nana*, *Arctostaphylos Uva-ursi*, *Tofieldia*, *Luzula spicata*, *Juncus trifidus*, *Lathyrus pratensis*, and *Lycopodium alpinum*. A walk was next taken from Kinlochewe to Achnashellach by Loch Clare, the chief plants seen being *Carex remota*, *Scirpus fluitans*, *Rosa Sabini*, *Rubus villicaulis*, *Eleocharis palustris*, and *Nymphaea alba*. Another wet day was spent about Strome on Loch Carron, when *Hymenophyllum unilaterale*, *Aspidium lobatum*, *Aira caryophyllea*, *Arenaria peplodes*, *Buda media*, *Poa nemoralis*, *Arenaria serpyllifolia*, *Veronica agrestis*, *Vicia hirsuta*, *Epilobium obscurum*, *Sedum anglicum*, *Viburnum Opulus*, *Asperula odorata*, *Hieracium anglicum*, *H. murorum*, *Triglochin maritimum*, *Juncus Gerardi*, *Allium ursinum*, etc., were noted. I next walked from Strome to Loch Alsh, and then ferried over Loch Duich, walking by the southern side of that lovely loch to Shiel House, and then on the same day ascended Sgurr Fhuaran, 3505 feet; from the summit a most gorgeous view was obtained, the rays of the setting sun lighting up a great expanse of eastern Scotland, while the knife-edge ridges of the hills about Loch Hourn were singularly magnificent. To the west, the peaks of Skye were almost obliterated by the richly coloured clouds. The day, of which the latter part had been fine, yielded a considerable number of plants including *Petasites vulgaris*, *Comarum palustre*, *Carex curta*, *Botrychium Lunaria*, etc., Sgurr Fhuaran was rather barren, but I had but little time to explore it. *Gnaphalium supinum*, *Hieracium chrysanthum*, *Juncus trifidus*, *Oxyria*, *Carex rigida*, *C. pallens*, *Cryptogramme crispa*, etc., were gathered on it. The next day opened badly, with a drizzling rain, which increased as the day went on to a steady downpour (if the word steady can be properly applied to a rain which, never ceasing, came in violent gusts again and again), but I

struggled through it from Shiel House to Kintail and then ascended A Glas-bheine, and afterwards visited the celebrated Falls of Glomak, retracing my way back to Kintail and continuing by the northern side of Loch Duich to Dornie, where I meant to have slept, but where I found the accommodation so limited that it only extended to a single bed, half of which was bespoke by an itinerant pedlar, so that I had to trudge my weary way on to Strome—making a journey of nearly forty miles. My gathering included *Mimulus guttatus*, which was quite naturalized in Kintail. A Glas-bheine afforded a large flowered variety of *Pinguicula vulgaris*, *Saxifraga oppositifolia*, *S. hypnoides*, *Silene acaulis*, *Cerastium triviale*, var. *alpinum*, Koch., *Saussurea*, etc. On the rocks about the falls of Glomak *Geranium sylvaticum* and *Rhodiola* occurred. The north sides of Loch Duich afforded *Hieracium crocatum*, *H. Pilosella*, *Oenanthe crocata*, *Sparganium minimum*, *Scirpus lacustris*, *S. maritimus*, *Chenopodium Bonus-henricus*, *Aira caryophyllea*, etc.

The result of my visit was that I found on this journey 23 species already on record (of which 16 were without personal authority), in Topographical Botany, 314 Phanerogams, and 28 Cryptogams, which were new county records. In addition to these, 16 varieties and 14 more or less naturalized plants were noticed. Among the latter were *Barbarea vulgaris*, *Acer Pseudoplatanus*, *Ulex europæus*, *Rosa rubiginosa*, *Doronicum Pardalianches*, *Ligustrum vulgare*, *Ulmus campestris*, *Fagus sylvatica*, *Populus nigra*, *Salix rubra*, *Avena fatua*, *Lolium italicum*, and *Ribes Grossularia*. Of the 314 Phanerogams, *Juncus compressus*, *Sagina maritima*, *Festuca arenaria*, Osb., and *Melampyrum sylvaticum* require verification. The specimens, so named by a well-known botanist, were not in good condition, so that in two or three cases the identity may not be accurate. Deducting these four from the list, we find that 338 species were added as native plants, and 14 as more or less naturalised plants to the county; while 23 species, on somewhat doubtful or old authority, were verified—a total of 365 species.

The second edition of "Topographical Botany" added nothing to the published knowledge of West Ross plants

except *Viburnum Opulus*, which was noticed by me in 1879, but accidentally omitted from my list. In the Report of the Record Club for 1881-82, my record of *Veronica humifusa* is included. In the 1883 report, Mr. C. Bailey records as additional species *Thalictrum maritimum* (*T. dunense*), *Anthyllis Vulneraria*, *Myosotis repens*, *Habenaria conopsea*, *Chara fragilis*, and the variety *gracilis* of *Euphrasia officinalis*. I added *Carex vaginata* from the Slioch. In the 1885 report, the Rev. E. F. Linton adds *Sherardia arvensis*, *Trifolium hybridum*, *Geum intermedium*, *Rosa dumalis*, *Lastrea Filix-mas*, var. *Borreri*, with some few plants already on record. The Rev. W. R. Linton records *Melica nutans* and *Rosa mollis*, var. *glabrata*. Mr. C. Bailey records *Rosa marginata*, which must be a glandular variety of *R. canina* or *R. coriifolia*, or a hybrid of these species, with *R. tomentosa* or *mollis*, and not the true *R. marginata*, which is a hybrid, having the continental *R. gallica* for one of its parents.

In 1886, Mr. Arthur Bennett records the occurrence of *Carex lævigata*, *Thymus Serpyllum*, var. *prostrata*, and *Equisetum sylvaticum* in "The Scotch Naturalist" as having been found by Mr. Grieve, but the latter was already on record. In the same year—1886—some members of the Summer Camp visited Applecross; the results of the investigations were published by Mr. John Allan in the Transactions of the Botanical Society of Edinburgh, pp. 117-120. In their explorations about Applecross and Loch Torridon, 286 species of plants were noticed, of which 50 were claimed as additions, but of these 23 had already been noticed. The actual additions (if correctly named) are *Lepigonum salinum*, *Vicia sepium*, *Ligusticum*, *Daucus Carota*, *Gentiana campestris*, *Myosotis palustris* (?), *Salicornia*, *Eleocharis palustris* (gathered, but not recorded, by me in 1880), *Asplenium marinum*, *Potamogeton natans*, *Equisetum maximum*, *Chara aspera*, *Anagallis tenella*, *Habenaria viridis*, *H. chloroleuca*, and *Epilobium angustifolium*.

The following species require verification:—*Viola canina* (this has been found in East Ross), *Potentilla argentea* (a misnomer, or casual), *Callitriche verna* (the occurrence of the segregate is improbable—the aggregate species is

already on record), *Scabiosa Columbaria* (a misnomer or casual), *Artemisia Absinthium* (a misnomer or an escape from cultivation), *Arctium majus* (my Loch Torridon plant has been pronounced to be *A. intermedium*), *Symphytum officinale* (I have seen the prickly comfrey as an escape, but not the true *S. officinale* in West Ross), *Veronica alpina* (very doubtful; if correct, an interesting record), *Rumex maritimus* (a sea-side *Rumex*, not the true plant), *Salix phylicifolia* (likely to occur, but I have not seen it in the county; forms of *S. cinerea* are often mistaken for it), *Juniperus communis* (*J. nanus* is common, also an intermediate plant). The above records, I am afraid, show that implicit reliance cannot be placed on the naming of the plants in the foregoing list. Two plants, however, that are mentioned in the text are additions—*Melampyrum pratense* (probably the *M. sylvaticum* of my 1880 list was the yellow-flowered form of this species) and *Scolopendrium*.

In 1886, "Gairloch," by J. H. Dixon, was published. This excellent account of the Parish of Gairloch contains a list of 368 plants, compiled by the author with the assistance of Lady Mackenzie, Mrs. Fowler, Mr. O. Mackenzie, Mr. A. Davidson, etc. This list probably precedes the records just referred to in the Applecross list. The Gairloch list, which includes many plants not previously recorded, however, contains so many errors that in a scientific point of view it will be safer to ignore it, at any rate it will be necessary to verify the occurrence of each plant recorded. Some of them are probable enough, others are wildly improbable, if referring to native species. *Ranunculus aquatilis*, *R. hederaceus*, and *R. bulbosus* (the latter a very rare plant in the north-west of Scotland—Davidson says it is common in Ross), *Papaver Rhæas*, *Cakile* (very likely to occur), *Coronopus didyma* (very improbable), *Arabis hirsuta*, *Cochlearia anglica* and *danica*, *Sisymbrium Thalianum*, *Sagina subulata*, *Hypericum perforatum*, *Geranium sanguineum*, *G. lucidum*, *Malva moschata*, *M. sylvestris* (not native), *Erodium cicutarium* (since verified by me), *Prunus Cerasus* (not native), *Potentilla reptans* (probably only a form of *P. Tormentilla*), *Rubus saxatilis* (since found by me), *Pyrus Aria* (if

correctly named probably only planted—Davidson says a tree grows in Strathcarron), *Epilobium angustifolium*, *E. alsinæfolium*, *Sedum reflexum* (I have seen this as a planted species), *S. glaucum* (doubtful in name), *Chrysosplenium alternifolium* (doubtful, *oppositifolium* is not rare), *Anthriscus sylvestris* (since found by me), *Scandix Pecten-veneris* (also verified), *Myrrhis odorata*, *Daucus maritimus* (a form of *D. Carota*), *Ligusticum* (verified), *Meum Athamanticum*, *Crithmum*, *Ægopodium* (found by me), *Galium verum* (verified), *G. uliginosum*, *Valeriana dioica* (most improbable), as are *Scabiosa Columbaria*, and *Matricaria Chamomilla*, *Anthemis maritima* (a misnomer), *Campanula rapunculoides* (? planted), *C. hederacea* (it occurs in Argyll), *Scrophularia aquatica* (a misnomer most likely for *S. nodosa*), *Mimulus luteus* (an escape, a variety is already on record), *Mentha sylvestris* and *M. piperita* (most improbable as native plants), *M. sativa* (verified by me), *Nepeta Cataria* (most improbable), *Lamium album* (very unlikely, perhaps a white-flowered form of *purpureum* or *intermedium*), *Ajuga pyramidalis*, possible, as is *Lithospermum maritimum*, *Myosotis collina*, verified by me, as also *Utricularia minor*; *Trientalis europæa* (a plant likely to be found), *Plantago Coronopus* (also probable), *Chenopodium urbicum* and *C. murale* (certainly erroneous), *Salicornia* (confirmed by me), *Polygonum viviparum* (seen by me in another district), *P. maritimum* (impossible), *Mercurialis perennis* (seen by me), *Salix pentandra* and *S. reticulata* (both rather doubtful), *S. alba* (planted), *S. nigricans* and *S. angustifolia* (the names are very doubtful), *Habenaria albida* and *H. chlorantha* (both verified by me), *Epipactis ensifolia* (this means *Cephalanthera ensifolia*, which has been found in north-west Scotland), *Listera ovata* (found by me), *Allium oleraceum*, *Ophioglossum vulgatum*, *Potamogeton lucens*, *Asplenium marinum*, *A. septentrionale*, and *Scolopendrium*.

In the year 1887 I again visited the county for a few days, until the wet weather and the midges drove me away from Kinlochewe. Glen Torridon, Ben Eay, and the Slioch were explored, and yielded the following plants:—*Lepidium heterophyllum*, var. *canescens*, *Erophila vulgaris*, *Arabis petræa*, *Viola tricolor*, *V. arvensis*, *Lychnis Githago*

Trifolium minus (a plant of cultivation), *Prunus Padus*, *Rosa tomentosa*, var. *sylvestris*, *Sedum acre*, *Hieracium tenellum* (Backh.), *H. nigrescens*, *Arctium intermedium*, *Centaurea Cyanus*, *Aster Tripolium*, *Arctostaphylos alpina* (confirmatory), *Lamium intermedium*, *Myosotis collina*, *Polygonum Convolvulus*, *Euphorbia Helioscopia*, *E. Peplus*, *Salix repens*, *Sparganium affine*, *Scirpus setaceus*, *Agrostis canina*, *Festuca sciuroides*, *Polystichum Lonchitis*, *Vicia sativa* (introduced), *Circea alpina* (confirmatory), *Hieracium holosericeum*, *H. lingulatum*, *Salix rugosa*, *S. herbacea* (confirmatory), *Carex xanthocarpa*, and *Listera cordata* (confirmatory), as well as some varieties.

Mr. C. Bailey adds *Cerastium tetrandrum* from Gairloch.

In 1889 I again visited Kinlochewe in order to clear up a difficulty respecting a form of *Agrostis canina*, gathered the previous year on Ben Eay, which in some respects approached *A. rubra*, Wahl. A large series of specimens collected this year from the same mountain, and also from the Slioch, were sent to Professor Hackel, who named them *Agrostis canina*, var. *scotica* (see "Scotch Naturalist," 1889-90, p. 239). The following additional plants were also observed:—*Rubus saxatilis* (in Dixon's list), *Viola sabulosa*, *Prunus avium* (? planted), *Hieracium globosum* (?), *H. melanocephalum* (?), *H. eximium* (?), *Campanula rotundifolia*, *Pyrola media*, *Myosotis repens*, *Mercurialis perennis*, *Carex paniculata*, *Scirpus maritimus*, var. *conglobatus*, and a large number of varieties.

A hawkweed, gathered by me at Kinlochewe in 1889, proved to be *H. praelongum*, an interesting addition. In the same year I verified the occurrence of *Arenaria sedoides*. Mr. Sewell adds *Carex pulla*.

In the "Scotch Naturalist," 1891, p. 186, Mr. Arthur Bennett cites the Jour. Bot., 1890, p. 40, for six additions to the flora, but four of the plants are already on record, and the other two — *Drosera intermedia* and *Elymus arenarius* — had not been observed by me. *Cladium Mariscus* (*C. jamaicense*) is given on the authority of Mr. A. Evans. In the same Journal for 1892, p. 125, eleven species are given on the authority of Mr. P. Ewing. Of these *Stachys arvensis*, *Plantago Coronopus*, *Urtica urens*,

Carex filiformis, and *Isœtes echinospora* are additions to the flora.

The year 1893 once again saw me in West Ross, but this time I chose fresh ground. My route was by the road from Garve to Ullapool by the Dirie More and Braemore. As this was done through streaming rain, but few plants were added to the list. On the following day, which was beautifully fine, I retraced my steps to Braemore, with its magnificent gorge and falls, and explored the sides of Loch Broom. *Elymus arenarius* occurred sparingly on the shingle, the true *Solidago Virgaurea*, var. *angustifolia*, *Bromus ramosus*, *Rubus mucronatus*, *R. fissus*, *R. Radula*, *R. incurvatus*, etc., were gathered. The beach at Ullapool afforded a plant which I had long been looking for — the glabrous-fruited form of *Sisymbrium officinarum*, Crantz. Here it was the prevailing form, but at Jeantown the typical form alone occurred. *Ranunculus vulgatus* grew in the shingle with *Cochlearia groenlandica*, *Galium verum*, *Buda media*, and *Fumaria Boraei*. The cultivated fields contained two varieties of *Veronica agrestis*; *Fumaria officinalis*, the yellow-flowered form of *Raphanus Raphanistrum*, and great abundance of *Spergula sativa* (the only form noticed); it was so abundant as to give a heavy valerianaceous odour to the air. At the head of Loch Broom *Hieracium sparsifolium* grew by the river, and at Ullapool *Hieracium reticulatum*, *H. auratum*, and *H. rubicundum* occurred. Near Ullapool, on the road to Loch Achall, some limestone rocks are exposed. These yielded some interesting plants, such as *Habenaria viridis*, *Orchis mascula*, *Anthyllis Vulneraria*, *Melica nutans*, *Pyrola secunda*, *Gentiana Amarella*, *Avena pubescens*, var. *Listera ovata* and *cordata*, and *Habenaria albida*. Most of these grew on the steep banks of the river, which for a short way cuts its course through the limestone. *Hieracium iricum* was conspicuous, as it was on the limestone of Kishorn. In Loch Achall we found *Lobelia Dortmanna*, *Callitriche hamulata*, *Chara fragilis*, etc.

One day we sailed by the Summer Islands to a little stretch of sandy beach near Polglass, where we found *Carex arenaria*, *Ligusticum scoticum*, *Agropyron junceum*, and *Daucus Carota*. A visit was paid to Dundonnell at

the head of Little Loch Broom. We ferried over Loch Broom and climbed the moorland road by Loch na h' Airbhe, in which grew *Ranunculus petiolaris*, *Carex rostrata*, etc. About Dundonnell we gathered *Viola tricolor* and *Raphanus* in the corn fields, and *Habenaria chloroleuca* in the grass fields near the shooting lodge. We then ascended the Glas Mheall Mor and the shoulder of An Teallach, but the rain and mist prevented the climb from being successful, if, indeed, there had been time to do much botanising. We gathered *Hieracium lingulatum*, *Epilobium alpinum*, *Vaccinium uliginosum*, *Salix herbacea*, *Rubus Chamæmorus*, *Arctostaphylos alpina*, etc., on the mountain, which we climbed to something over 3000 feet, when the mist and rain hindered further work. On our way back we found, near Dundonnell, *Rubus pyramidalis* and *R. fissus*. By the time we reached Loch Broom the rain had cleared off, so that the passage across the lake was one of rare beauty, the sea being without a ripple, reflecting all the colours of a magnificent sunset. Before we left Ullapool we found *Enanthe crocata*, *Coronopus procumbens*, *Buda marina*, *Ægopodium Podagraria*, etc.

My next stopping place was Strathcarron, at the head of the loch of that name. Here we found *Ruppia*, *Scirpus rufus*, *Salicornia*, *Arenaria peploides*, *Carex extensa*, *C. chrysites*. The corn fields afforded *Bromus secalinus*, *Viola segetalis*, and *Buda rubra*. On the shingly margin of the river, *Galium verum*, *Silene maritima*, *Lepidium heterophyllum*, var. *canescens*, *Anthyllis Vulneraria*, *Hieracium auratum*, and *H. duriceps*. *Rumex domesticus*, and *conspersus* were gathered near the station. A grass field contained several plants of *Galium erectum*. On the shingle near Jeantown we found *Caucalis Anthriscus*, *Malva sylvestris*, *Volulus sepium*, *Arctium intermedium* and several garden stragglers, if indeed the *Malva* and *Volulus* do not belong to that class.

In a picturesque ravine near Jeantown we saw *Osmunda*, *Festuca sylvatica*, *Allium ursinum*, *Bromus ramosus*, *Brachypodium gracile*, *Agropyron caninum*, *Potentilla Fragariastrum*, *Asplenium viride*, *Polystichum aculeatum*, *Hieracium anglicum*, etc. An extremely hot day was occupied in ascending a mountain north of the Strath, but we found it

very bare and the plants much dried up. On the rocks at about a 1000 feet *Juncus trifidus* occurred, with a large form of *Salix herbacea*. We also gathered *Hieracium lingulatum*, and on the higher shoulder *Arctostaphylos alpina* and *Loiseleuria procumbens* dried up by the hot sun. The base of the mountain yielded a very small form of *Chara fragilis*, *Scirpus fluitans*, and *Arenaria serpyllifolia*, the two former growing in a pool, the latter by the roadside. Another visit to Jeantown afforded *Stachys ambigua* growing with its assumed parents *S. palustris* and *S. sylvatica*. This locality is given for it in Hooker's Flora Scotica, *Æthusa Cynapium* grew in cultivated ground. Another day we went from Carron by Jeantown to Kishorn during a violent storm of thunder and rain, which accompanied us over the celebrated Beallach na bo Pass to Applecross. The beach at Applecross with its curious limestone pavement gave *Sagina nodosa*, and *Epilobium parviflorum*, which grew in the fissures in the rock. *Rubus corylifolius* was not uncommon on clay. A small fresh water loch near the sea, called Loch a Mhuilinn, had *Nymphaea alba*, *Utricularia neglecta* and *minor*, *Potamogeton natans*, *Scirpus lacustris*, *Carex rostrata*, *Veronica scutellata*, *Chara fragilis*, and *Subularia aquatica*. In the woods grew *Equisetum maximum* and *Hieracium cymbosum* (*H. Eupatorium*). By the shingle, *Atriplex Babingtonii*, var. *virescens* was common, *Agropyron junceum*, *Sedum acre*, native, *Erodium cicutarium*, *Geranium dissectum*, white-fruited *Rubus idaeus*, *Erophila vulgaris*, *Cerastium tetrandum*, etc. A handsome subcristate rose was common, it does not answer to any of our varieties, M. Crepin considers it to be a glandular variety of *R. glauca*. *Rosa coriifolia*, in varied forms also occurred.

The return journey over the Beallach na bo Pass yielded *Juncus trifidus*, *J. triglumis*, *Saxifraga hypnoides*, *Saussurea*, *Epilobium alpinum*, *Cryptogramme crispa*, *Hieracium mureorum*, var. *ciliatum*, *Rhodiola*, *Gnaphalium supinum*, *Silene acaulis*, *Thalictrum alpinum*, *Luzula spicata*, etc. In a pool at the top of the pass (2050 feet) *Subularia*, *Isoetes lacustris*, var. *falcata* and *Callitriche hamulata* occurred. By Loch Kishorn we gathered *Scirpus maritimus*, and about Kishorn on the limestone, *Hieracium iricum*, *Habenaria conopsea*,

Scolopendrium, *Veronica anagallis*, var. *anagalliformis*, *Salix repens*, and *S. ambigua*, *Festuca elatior*, etc.

My visit to West Ross in 1893 was a very pleasant one, seven out of the ten days I spent there being fine; the preceding drought had, however, been prejudicial to vegetation, the sedges especially being in bad condition. My marked catalogue shows that I noted nearly 480 species, of which about 75 were additions to the flora, and 15 more were species more or less naturalised, which had not been previously noted, and 3 more without personal authority in "Topographical Botany," were now verified. A large number of varieties were also observed. The total number of plants on record for the county is now over 570. The following is a complete list of the county plants so far as are at present known to me. In naming the critical forms I have had the kind help of Professor Hackel, M. Crepin, Rev. W. Moyle Rogers, Rev. E. Marshall, Messrs. F. J. Hanbury, H. and J. Groves, and my kind friend Arthur Bennett, who has in many ways rendered assistance, and especially in looking over my rough notes and generously adding some of his own. I must also thank Mr. Mackenzie, of the Caledonian Hotel at Ullapool, for much kind attention during my agreeable sojourn at his house.

In 1894 I paid a flying visit to Ullapool towards the end of June, but the season was rather backwards, the *Rubi*, *Rosæ*, and *Hieracia*, with few exceptions, not being sufficiently advanced to determine, while the spell of unusually hot weather which set in did not make walking more enjoyable. My object was to visit the limestone rock, called by Lightfoot, "Creg ach no caen, upon the boundaries of Coygach and Assynt, just on the confines of Ross-shire and Sutherland, about ten miles from Loch Broom, on the road to Lead-beg." On the geological ordnance chart, No. 101, the limestone rocks are marked as thinning out before the Ross boundary is touched on the hill, which is there called Cnoc an t-Sasunnaich (1258 feet high), and which has a fine range of cliffs exposed on the western side. The high road to Inchnadamph runs at their base at an elevation of between 700 and 800 feet above sea-level. On the Sutherland portion

the limestone occurs even as low as 400 feet, and the fields in the village of Elphin were blue with *Polygala vulgaris*, or showed the feathery fruits of *Dryas*, while the profusion of *Trollius* and *Orchis latifolia*, the latter in superb colour, must be seen to be appreciated. From the summit of the hill a magnificent view is to be obtained of the grand Ben More of Coigach, of Canisp, An Stac, Suilven, and Ben More of Assynt. A close examination led me to believe that the limestone rocks, which rise at a gentle angle from north to south, must extend into Ross, since *Dryas* was found beyond the boundary, but at a much higher level (over 1000 feet) than in Sutherland, and at the top of the fucoid beds. With *Dryas* also occurred *Draba incana*, and a patch of the local *Carex rupestris* was also noticed. A solitary tuft of *Adaxa Moschatellina* was also observed. *Epilobium angustifolium* occurred as an undoubted native plant. *Polygala vulgaris* was very beautiful. *Allium ursinum* was seen in one place, but not observed in Sutherland, while *Silene acaulis*, which occurred nearly down to the road level in Sutherland, was not noted in Ross. *Thalictrum alpinum*, *Polygonum viviparum*, *Polystichum Lonchitis*, *Asplenium viride* were rather common. *Phegopteris polypodioides* and *P. Dryopteris* also occurred, but the latter was not quite typical, reverting in leaf cutting somewhat to *P. Robertiana*. *Alchemilla vulgaris* occurred both as the glabrous and as the pubescent plant. *Rubus saxatilis* in flower (with a hawthorn like odour). *Iuzula maxima* and *Carex pilulifera*, the latter as the acute glumed form, were gathered. A form of *Poa sub-cerulea* also was noticed on the rocks, but no *Geranium sylvaticum*, *Rhodiola*, or *Oxyria* was observed. A form of *Poa* and a few other critical plants are still under observation.

Another day was spent at Dundonnell endeavouring to refine Lightfoot's plants (it will be observed that all his records from the limestone rocks were verified), but without success. Considerable alteration has taken place at Dundonnell since the time of his visit, and the woods, I am told, have been much cleared. The visit, however, gave additional localities for *Festuca sylvatica*, *Asperula odorata*, *Carex remota*, *C. pallescens*, *Allium ursinum*, and

other interesting plants. The scenery towards the head of the glen is of a very interesting character. Near Dundonnell, in a swampy, shady place, occurred a plant which, I have little doubt, is identical with Forster's *Caltha radicans*. It rooted freely from the nodes, and formed an interlacing mass. The flowers were decidedly smaller than in *C. palustris*, and the sepals narrower, and therefore not contiguous. The shape of the radical leaves varied. Sometimes they were almost as deltoid as the one figured in "English Botany;" at others, they were scarcely different from the type. The serration also varied very considerably. The leaves on the stem above the first rooting point were almost invariably of a bluntly, triangular form. It would be interesting to learn if Don's plant had the actual root leaves as well as the leaves of the stem at its first rooting point of this deltoid shape. I may say that the plant occurred in several places, and was uniformly rooting in its habit. All the flowers which I observed had narrower and rather smaller sepals. The creeping stems were very brittle, and it was not quite easy for that reason to get perfect specimens.

A day spent on An Teallach. was toilsome, and not productive, the season being backward and the ground barren. *Lycopodium annotinum* was gathered, and *Arctostaphylos alpina* was rather frequent on the lower shoulders of the hill. *Lycopodium alpinum*, var. *decipiens*, *Juncus trifidus*, *Carex rigida*, *Armeria*, *Rhodiola*, *Luzula spicata*, *Loiseleuria*, *Cornus suecica*, *Rubus Chamæmorus*, and *Vaccinium uliginosum* (the latter in flower) were noticed.

A day was spent in walking to Rhidorroch by Loch Achall, but the only addition made to the flora was *Sagina subulata*, which occurred in the path near the shooting lodge. *Habernaria albida*, *H. viridis*, *H. conopsea*, *H. bifolia*, *Orchis incarnata*, *Listera cordata*, *Melica nutans*, and *Carex pallescens* were seen.

Another day or two was spent at Strome, where, between the station and Plockton, *Corydalis claviculata*, *Rubus rhamnifolius*, *Myosotis repens*, *Hypericum Androsæmum*, and *Oxyria* were noted, but the intense heat made botanising a toil. The results of this visit were rather meagre, five additional species and five confirmatory records

only being made; but the few *Hieracia* gathered, now in Mr. Hanbury's hands, will, it is hoped, yield another record.

The sign (*) means that the Author, it is believed, is the first recorder of the plant for the county; the sign (:) means that the plant is not a native.

THALICTRUM ALPINUM, L.—On the mountains near Strathcarron; plentiful on Meall Gorm and Sgurr na Caorach; in a barren state on Sgurr Fhuaran; probably not a rare plant on the higher hills. It also comes down to 900 feet on the fucoid rocks of Cnochan.

T. DUNENSE, Dumort.—On the sand at Gairloch (Mr. C. Bailey), 1883.

* *ANEMONE NEMOROSA*, L.—In many wooded situations, as on Loch Maree side, Dundonnell, etc.

(? *RANUNCULUS HEDERACEUS*, L.—Gairloch, in Dixon's list, requires verification; it is likely to occur as it is reported from Skye. *R. aquatilis* is also given in the same list.)

(*R. LINGUA*, L.—"Kintail and Gairloch not uncommon" (Davidson). I have not seen it. Was the large form of *R. Flammula* mistaken for it?)

* *R. FLAMMULA*, L.—Common; it is a variable plant. The variety *pseudoreptans* is frequent on the gravelly margin of lochs, etc.

* *R. PETIOLARIAS*, Marshall.—This occurs in Loch Achall at 265 feet, in Loch na h' Airbhe at 700 feet, and in a small mountain loch on a mountain in Strathcarron at over 2000 feet. In the latter situation it appeared to grade into the type. I should be content to give it varietal rank, notwithstanding its *Littorella*-like radical leaves. It is probably widely distributed.

* *R. ACRIS*, L., var. *VULGATUS*, Jord.—A common plant, widely distributed; from the sea-level to 4000 feet. A very hairy form occurred on the beach at Ullapool, but this and other forms I defer naming till I have had the opinion of Herr Freyn. *R. acris*, L. (*R. Borœanus*, Jord.), near Braemore.

* *R. REPENS*, L.—Not uncommon on low ground. A curious form occurred on the shingly margin of the river

Carron; it has the leaves much more finely cut, and the plant unusually small.

(? *R. BULBOSUS*, L.—Only in Dixon's list of Gairloch plants; possibly an error, although Davidson says it is common in Ross.)

* *R. FICARIA*, L.—Attadale; rare, or my visits made too late in the season to observe it.—Seen at Dundonnell in 1894.

* *CALTHA PALUSTRIS*, L.—Common; but the var. *minor* appears much less frequent in Ross than on the Cairngorms or Breadalbane hills. I saw it on An Teallach at about 2000 feet.

* *C. RADICANS*, Forster.—In shady, marshy situations at the head of Little Loch Broom, near Dundonnell.

TROLLIUS EUROPÆUS, L.—Not unfrequent, and widely distributed. I saw some plants at an elevation of upwards of 2000 feet in Strathcarron. West Ross not localised (Davidson).

: *BERBERIS VULGARIS*, L.—Occurs as a planted shrub at Ullapool and Braemore, and, according to Mr. Dixon, at Gairloch.

* *NYMPHÆA ALBA*, L.—In Loch Coulin and Loch a Mhuilinn.

: *PAPAVER SOMNIFERUM*, L.—On the shingle at Jeantown and Applecross; probably a garden escape.

(? *P. RHÆAS*, L.—In Dixon's list, which also gives *P. dubium*. The latter has a more northern range than this species, which has not been observed by me in West Ross.)

* *P. DUBIUM*, L.—Rare, and only of casual occurrence, as at Kinlochewe, Dornie, and Gairloch—in the latter place on the authority of Mr. Dixon. In 1893–94 I did not see a single poppy in the county. The Kinlochewe plant was the var. *P. Lamottei*.

* *P. ARGEMON*, L.—Like the foregoing, scarcely naturalised. I saw it by the rail side near Strome in 1880.

CORYDALIS CLAVICULATA, DC.—Rare. Kintail, and between Strome Ferry and Plockton. It is given in the Gairloch list, probably on the authority of Mr. Davidson, who records it in "Scotch Naturalist," vol. ii., from Melvaig, near Gairloch.

* *FUMARIA BORÆI*, Jord.—On shingle at Ullapool, where

it also grew in potato fields. Mr. Dixon includes *F. capreolata* in the Gairloch list, which probably means this.

* *F. OFFICINALIS*, E.—Rare, in cultivated fields at Ullapool and Dundonnell.

* *NASTURTIUM OFFICINALE*, Br. (*Roripa Nasturtium*, Beck).—Near Ullapool and Applecross; probably overlooked.

* *BARBAREA VULGARIS*, Br.—Rare, and probably not native. In the Gairloch list I saw it at Strome.

* *ARABIS PETRÆA*, Lamk.—On the quartzite slopes of Ben Eay, at an elevation of 2000 to 2800 feet, only as the glabrous plant; it has flowers rather larger than the plant from the Cairngorms, but not so large as those of the var. *grandifolia* from Ben Laiogh, in Argyll. Davidson records it from Gairloch, but it is not usually a plant of the lowlands. Is Mr. Davidson's record correct?

(? *A. HIRSUTA*, Br.—Given in Mr. Dixon's list. It probably occurs as it has been found in Skye and East Ross.)

* *CARDAMINE PRATENSIS*, L.—Common; usually as the plant with lilac flowers and pedicelled leaflets; figured in "English Botany," 776, which appears, according to Kerner, to be the *C. palustris*, Petermann. At Applecross I saw the true *C. pratensis*—the plant with white flowers and sessile leaflets which is figured in "Flora Danica," No. 1039 (1790).

* *C. HIRSUTA*, L.—Not rare. At Loch Carron, Ullapool, and Applecross.

* *C. FLEXUOSA*, With.—Not uncommon, as at Jeantown, Kintail, Strome, Ullapool, and at Applecross; also as the var. *umbrosa*, Gren. et Godr., by a waterfall at Jeantown.

DRABA INCANA, L.—On Creg ach na caen, near Ledbeg (Lightfoot 1777). It occurs on the limestone rocks at that place in both counties, and near Gairloch.

(? *D. RUPESTRIS*, Br.—Ben Sléugach (Davidson). If correct, very interesting; was it not a small form of *D. incana*?)

* *EROPHILA VULGARIS*, DC.—In the Gairloch list. Seen by me at Kinlochewe, and by the roadside at Applecross; it is most likely not uncommon.

* *COCHLEARIA OFFICINALIS*, L.—Common on the coasts, and as the var. *alpina*, Wats., on some of the hills, as on An Teallach, and on A Glas-bheine, in Kintail.

* *C. GRÆNLANDICA*, L.—On the coast at Ullapool, very fine specimens.

(*C. DANICA*, L., and *C. ANGLICA*, L., are both given in Dixon's list.)

: *HESPERIS MATRONALIS*, L.—Naturalised about the ruins of a kirk near Jeantown.

SISYMBRIUM THALIANUM, Gay.—Given in Dixon's list, and likely correctly; my visits have been made rather late in the season.

* *S. OFFICINARUM*, Crantz.—On the shingle and in cultivated ground at Jeantown, as the type plant with pubescent siliquas. At Ullapool the form with glabrous siliquas alone occurred, it is the var. *leiocarpum*, DC., which I had long sought for in Britain, and which I had once seen at Meran, in Austria.

SUBULARIA AQUATICA, L.—In a small loch near the summit level of the Beallach na bo Pass, at a little over 2000 feet, and in Loch a Mhuilinn, near the sea-level, caulescent and acaulescent forms occurred.

: *BRASSICA NAPUS*, L.—As a weed of cultivation on the shingle at Jeantown.

* *B. SINAPISTRUM*, Boiss.—Kinlochewe, Strome, etc. (Colonist).

* *B. ALBA*, Boiss.—Loch Alsh, Ullapool, and Applecross (Colonist).

* *BURSA PASTORIS*, Wib.—Common about Ullapool, etc.

* *CORONOPUS PROCUMBENS*, Gilib.—On the grassy margin of Loch Broom at Ullapool.

(? *C. DIDYMA*, Sm.—In Dixon's Gairloch list, almost certainly incorrect.)

LEPIDIUM HETEROPHYLLUM, Benth., var. *CANESCENS*, Gren. et Godr.—On the shores of Loch Torridon, near Loch Maree, and on the stony border of the river Carron. The older name appears to be *L. heterophyllum*, var. *campestre*, F. Schultz, in Fl. Gall. et Germ., Exs. 3 et 4, Introd. p. 3, 1840. It is the *L. Smithii*, Hook. Davidson records it from Gairloch.

CAKILE MARITIMA, L.—Gairloch (Dixon). Likely to be found.

* *RAPHANUS RAPHANISTRUM*, L.—Abundant among the oat crops at Dundonnell and Applecross and Ullapool, always as the yellow flowered form.

* *VIOLA PALUSTRIS*, L.—Common.

(*V. CANINA*, L.—Given in the Applecross list, but requires verification.)

* *V. RIVINIANA*, Reich.—Common. I suspect it is the "*V. canina*, L.," of the Applecross and Gairloch lists.

* *V. TRICOLOR*, L.—In a field near Loch Torridon, and in oat fields at Dundonnell. Dixon has it in his list.

* *V. ARVENSIS*, Murray.—Near Torridon and Ullapool, and a form identical with *V. segetalis*, Jord., at Strathcarron.

* *V. LUTEA*, Huds.—Near Braemore.

* *V. SABULOSA*, Jord.—Loch Torridon side, Strathcarron, Applecross, etc. A plant very near to, if not identical with, *V. Curtisii*, Forst.

* *POLYGALA VULGARIS*, L.—Not common, Sgurr Fhuaran, Sgurr na Caorach, and in beautiful condition on the Cnochan rocks.

* *P. SERPYLLACEA*, Weihe.—Common and widely distributed.

* *SILENE CUCUBALUS*, Wibel.—Rare, and perhaps only of casual origin. I saw it at Strome in 1880.

* *S. MARITIMA*, With.—Rather common, not only on the coast, but also on the shingly margin of Loch Maree, and the River Carron, etc.

S. ACAULIS, Jacq. (see "Topographical Botany").—I have gathered it on Ben Eay, but it appears to be rather a scarce plant on the Ross mountains.

* *LYCHNIS DIOICA*, L.—Locally common, abundant about Jeantown, and of very rich crimson colour.

* *L. ALBA*, Mill.—Rare and only a colonist, if, indeed, it is more than a casual. I saw it at Dornie, at Ullapool, Jeantown, Strome Ferry, etc.

* *L. FLOS-CUCULI*, L.—Frequent.

* *L. GITHAGO*, Scop.—Little more than a casual. A solitary specimen in an oat field at Kinlochewe. Dixon includes it in his list, but does not consider it a native. Davidson says it is too common in Ross-shire.

CERASTIUM TETRANDRUM, Curt.—Gairloch (Mr. C. Bailey), sparingly on the coarse sand at the head of Applecross Bay, 1893; Ullapool, 1894.

* *C. GLOMERATUM*, Thuill.—Common, also as the var. *apetalum*, Dum. at Applecross, Braemore, and Dundonnell.

* *C. TRIVIALE*, Link.—Common and widely distributed. The var. *alpinum*, Koch., in its typical form on A Glas-bheine in Kintail, on An Teallach and on Meall Gorm of Applecross. Boswell Syme said the specimen from the former locality was the true plant, his var. *alpestre*, Lind.

* *STELLARIA MEDIA*, Cyr.—Abundant. The var. *major*, Koch., at Linlochewe and Inverlael.

* *S. HOLOSTEA*, L.—Local. Near Attadale, Jeantown, Kishorn, Rhidorroch, etc.

* *S. GRAMINEA*, L.—Not rare. Keppoch, Braemore, Dundonnell, Kintail.

* *S. ULIGINOSA*, Murr.—Common.

* *ARENARIA SEDOIDES*, Schultz.—“Topographical Botany” without personal authority. Apparently scarce. I saw it on Slioch at 1800 feet, and also as the var. *apetala*.

* *A. SERPYLLIFOLIA*, L.—Rare, but possibly native. By the railway at Strome, and dry roadside at Strathcarron, also near Applecross.

* *A. PEPOIDES*, L.—Locally abundant on the coast, as at Torridon, Ullapool, Jeantown, Applecross. At Ullapool the var. *diffusa*, Horn., occurred with the type.

(*SAGINA MARITIMA*, Don.—A specimen which I gathered by Loch Duich was so named by a botanical referee. I have not been able to refind it in the county, but it is a plant which is likely to be found, as it occurs in East Ross and Caithness.)

* *S. PROCUMBENS*, L.—Not uncommon, and variable.

* *S. NODOSA*, E. Mey.—Local. I have only seen it in the crevices of the limestone pavement at Applecross; it was the glabrous plant.

S. SUBULATA, Presl.—Given in Dixon's list. I found a solitary patch on the shingle path near Rhidorroch Lodge in 1894.

* *SPERGULA SATIVA*, Boenng. —Abundant in many corn fields, and about Ullapool, Dundonnell, Applecross, so profuse as to give a heavy-valerianaceous odour to the air, especially in the evening. *S. sativa* alone occurred; although I examined many scores of specimens, I was unable to find one with papillate seeds.

* *BUDA RUBRA*, Dum. (*ARENARIA RUBRA*, L.)—Rare. A few plants at Strathcarron, and in dry fields at Kishorn.

* *B. MEDIA*, Dum. (*SPERGULARIA MARGINATA*, Syme).—Rather common on the coast, as at Loch Carron, Applecross, Polglass, etc.

* *B. MARINA*, Dum. (*SPERGULARIA NEGLECTA*, Syme).—Rare. Morefields, near Ullapool, and shores of Little Loch Broom. (*Lepigonum salinum*, Applecross, Mr. Allan.)

* *B. RUPESTRIS* (*SPERGULARIA RUPESTRIS*, Lebel).—Loch Carron, 1880. I did not see it in 1893. Boswell Syme so named my specimen, and Mr. Arthur Bennett says he has a note, that he saw one from me.

* *MONTIA FONTANA*, L.—Rather common. The var. *major*, Allione (*M. rivularis*, Gmel.), at Lochalsh, Braemore, and Applecross.

HYPERICUM ANDROSÆMUM, L.—Rare. Loch Maree (Hooker), Kintail, Glenelg, Duncraig.

(*H. PERFORATUM*, L.—In Dixon's list only.)

: *H. CALYGINUM*, L.—Balmacarra (Davidson). Planted, of course, but the recorder gives no particulars.

* *H. PULCHRUM*, L.—Common. The var. *procumbens*, Rostrup, in Coigach.

(: *MALVA MOSCHATA*, L.—In Dixon's list; he does not consider it native.)

: *M. SYLVESTRIS*, L.—Dixon thinks this is not a native. It is plentiful on the shingle in Jeantown, but it is also cultivated there, so that it is very likely only a straggler from the gardens.

: *TILIA PLATYPHYLLOS*, Scop.—Planted at Braemore.

: *T. VULGARIS*, Hayne.—Planted at Braemore, Kishorn, etc.

(*RADIOLA LINOIDES*, Roth. (*Millegrana minima*).—In Dixon's list. It is given in "Topographical Botany" for 105 Ross West, "Ross Cat.," probably by the authors confusing Ross's list of Mid Ebudes plants with mine from West Ross. This opinion is confirmed by seeing on p. 598 of that work that Mr. Ross is credited with supplying the list of Mull and West Ross plants in Rep. of Rec. Club, whereas he only compiled the list of Mull plants, in which he records *Radiola Millegrana*. It is very likely to occur, as it is usually overlooked.)

* *LINUM CATHARTICUM*, L.—Common.

: *L. USITATISSIMUM*, L.—A casual on the beach at Jeantown.

(? *GERANIUM SANGUINEUM*, L.—In Mr. Dixon's list only.)

* *G. SYLVATICUM*, L.—Rare. I have only seen it on the steep rocks about the falls of Glomak.

* *G. MOLLE*, L.—Not common. Strome, Applecross, Kinlochewe, Ullapool, Kishorn.

* *G. DISSECTUM*, L.—Rare. Only seen at Applecross.

(? *G. LUCIDUM*, L.—In Dixon's list. If correctly named, was it wild?)

* *G. ROBERTIANUM*, L.—Glen Docharty, Jeantown, Dundonnell, etc.; var. *album*, at Inverlael and Applecross.

* *OXALIS ACETOSELLA*, L.—Local; on the base of Slioch, at Strome, Kishorn, Dundonnell, etc.

* *ERODIUM CICUTARIUM*, L'Her.—In Dixon's list. I saw it on one station at Applecross in 1893.

* *ILEX AQUIFOLIUM*, L.—Not uncommon, and native, as in Glen Docharty, on the sides of Slioch, in Coigach, Dundonnell, etc.

: *ACER PSEUDOPLATANUS*, L.—Loch Duich, Loch Carron, etc. Planted, and in some cases self-sown plants.

: *ULEX EUROPEUS*, L.—Extensively planted as a cover for game, but not, I think, native.

* *CYTISUS SCOPARIUS*, Link.—Not very common, but possibly native. Strome, Ullapool, Kishorn.

: *MEDICAGO LUPULINA*, L.—A relic of cultivation, at Kinlochewe. Dixon gives it in his list.

* *TRIFOLIUM PRATENSE*, L.—Common, and generally distributed in the low lands.

: *T. HYBRIDUM*, L.—As a relic of cultivation. Strome Ferry (E. F. Linton), field borders, Dundonnell, Jeantown, etc.

* *T. REPENS*, L.—Common, and generally distributed in the low lands.

* *T. PROCUMBENS*, L.—Strome, Ullapool; rare.

* *T. DUBIUM*, Sibth.—Kinlochewe, Applecross, Strathcarron, etc.; and, as the var. *pygmaeum*, Soy.-Will., at Ullapool.

ANTHYLLIS VULNERARIA, L. (Gairloch, C. Bailey).—Appears where the limestone rocks are exposed, as near Ullapool, Kishorn, and Cnochan. Also on river shingle, as at Kinlochewe and Carron.

* *LOTUS CORNICULATUS*, L.—Common; often as a larger

flowered form than the mid-English plant, and sometimes, especially by the coast, as the var. *crassifolius*, Pers. Var. *villosus*, Ullapool.

* *VICIA HIRSUTA*, Koch.—Strome, Carron, Jeantown, Kishorn.

* *V. CRAECA*, L.—Common, especially as a corn field plant. The var. *incana*, Thuill, at Ullapool, on the shingle.

V. SYLVATICA, L.—Uncommon. Keppoch. It was given in "Topographical Botany" without personal authority. I did not see it at Ullapool, Applecross, or Strathcarron.

V. SEPIUM, L.—Kinlochewe, Braemore, Applecross, etc. Not uncommon, and in two forms.

: *V. SATIVA*, L.—Occurs as an outcast or straggler from cultivation, as at Kinlochewe.

* *V. ANGUSTIFOLIA*, L.—Rare. Ullapool and Strathcarron.

* *LATHYRUS PRATENSIS*, L.—Not uncommon; usually as the glabrous plant.

* *L. MONTANUS*, Bernh.—Braemore, Dundonnell, Kishorn, etc.; also the var. *tenuifolius*, at Braemore.

* *PRUNUS SPINOSA*, L.—On my first visit I thought this was planted in West Ross, but now I think it may be native in Strathcarron and at Applecross; there were some old bushes by the river at Ullapool.

: *P. INSTITIA*, L.—Doubtfully wild at Applecross, etc.

: *P. DOMESTICA*, L.—Most likely the result of planting in Strathcarron, etc.

(*P. CERASUS*, L.—In Dixon's list, probably an error, the next species may have been intended.)

: *P. AVIUM*, L.—Glenelg, Strathcarron, Dundonnell, in what was an old hedgerow. A doubtful native.

* *P. PADUS*, L.—Applecross, Kishorn, Inverlael, Kinlochewe, etc.

: *SPIRÆA SALICIFOLIA*, L.—Inverlael. Certainly planted.

* *S. ULMARIA*, L.—Not uncommon. So far as I noticed always as the plant with the leaves white underneath, var. *discolor*, Kod.

* *RUBUS IDÆUS*, L.—Not common, but I think native. It grew by the side of Loch Coulin, at Braemore, and at Applecross, as the var. *leucocarpus*. It is possible that the latter plant may be the result of ancient cultivation.

- * *R. NESSENSIS*, Hall.—Inverlael.
- * *R. FISSUS*, Lindl.—Near Ullapool, in several stations.
- * *R. PLICATUS*, W. and N.—Near the shooting lodge at Dundonnell.
- * *R. RHAMNIFOLIUS*, W. and N.—Ströme Ferry.
- * *R. INCURVATUS*, Bab.—A plant from Ullapool and Inverlael, the Rev. Moyle Rogers puts under this name.
- * *R. LEUCOSTACHYS*, Sm.—Rare, Ullapool.
- * *R. PYRAMIDALIS*, Kalt.—Ullapool, and in very fine condition at Dundonnell.
- * *R. VILICAULIS*, Koel., var. *Selmeri* (Lindb.).—Strathcarron, Ullapool, Kinlochewe.
- * *R. MACROPHYLLUS*, W. and N.—Inverlael.
- * *R. PULCHERRIMUS*, Neum.—Jeantown.
- * *R. MUCRONATUS*, Blox.—Not rare. About the side of Loch Broom, Braemore, etc.
- * *R. RADULA*, W. and N.—Large, handsome plants at Ullapool.
- R. CORYLIFOLIUS*, Sm.—Near Ullapool, and on limestone at Applecross and Kishorn. A small form. Davidson records it from Glen Shiel.
- * *R. SAXATILIS*, L.—In Dixon's list. I saw it on Slioch at about 2800 feet. It occurred on Meall Gorm of Applecross, on Cnochan rocks and An Teallach, and as the var. *setodermis*, Borb. (in Baenitz. Herb. Europ.), near the sea level at Jeantown.
- R. CHAMÆMORUS*, L. ("Topographical Botany").—I saw it on Slioch in 1889, and in fine fruit on An Teallach in 1893.
- DRYAS OCTOPETALA*, L.—"On a limestone rock called Cregach no caen, upon the boundaries of Coygach and Assynt, just on the confines of Ross-shire and Sutherland" (Dr. Lightfoot). I saw it on the Ross-shire side of the boundary in 1894.
- * *GEUM URBANUM*, L.—Not uncommon, as at Loch Carron and Kinlochewe.
- G. INTERMEDIUM*, Ehrh.—Ströme (Linton 1885), Jeantown.
- * *G. RIVALE*, L.—Rather common. Loch Long, Braemore, Dundonnell, Jeantown, in splendid flower at about 2000 feet on a mountain in Strathcarron, and on the Cnochan rocks.

* *FRAGARIA VESCA*, L.—Rather common.

* *POTENTILLA FRAGARIASTRUM*, Ehrh.—Apparently rare. I saw it only by the waterfall at Jeantown, and at Applecross.

* *P. TORMENTILLA*, Neck.—Abundant and generally distributed.

(? *P. REPTANS*, L.—In Dixon's list. A misnomer? It is a rare plant in the north.)

* *P. ANSERINA*, L.—An abundant and luxuriant shore weed on the shingle, as at Jeantown, Applecross, etc. It usually occurred with the leaves green above, the var. *sericea*, Koch., with leaves silvery on both sides being rare; it was noticed at Ullapool.

(? *P. ARGENTEA*, L.—One of the plants recorded by the Summer Camp from Applecross. The true plant is most unlikely to be found native so far north; perhaps it was a slip of the pen for the preceding species, but it was given as a new record, while I recorded *P. Anserina* in 1880.)

P. SIBBALDI, Hall. f.—"Topographical Botany." Rare. Slioch.

* *ALCHEMILLA ARVENSIS*, Scop.—Rather rare or overlooked. Dornie.

* *A. VULGARIS*, L.—Rather common. Large plants of the var. *glabra*, W. et Gr., occurred in the shingly margin of the river Carron, but it varied into forms with more pubescent foliage. The glabrous form grew in the stony bed of the stream that descends from Ben Eay. On the hills a small pubescent form is common, especially between Kishorn and Applecross, but I should not call it *A. montana*, Willd. The two plants grew together, and kept fairly distinct on the Cnochan rocks.

A. ALPINA, L.—See "Topographical Botany." Common.

ROSA SPINOSISSIMA, L.—See "Topographical Botany." I have not seen it in Ross.

* *R. INVOLUTA*, Sm., Gairloch (Davidson), and as *R. Sabini*, Woods.—By the side of Loch Clare, and by Loch Maree. This, M. Crepin says, is a hybrid of the former with *R. tomentosa*.

* *R. MOLLIS*, Sm.—Not unfrequent in the lower wooded straths, as at Loch Maree, Ullapool, Dundonnell, Applecross, Kishorn, Kintail, etc. The var. *cærulea*, Bak., I

have seen at Kinlochewe, etc. The var. *glabrata*, Fries. (E. F. Linton), Strome Ferry, 1886, not previously noticed in Britain.

* *R. TOMENTOSA*, Sm.—Common in the lower glens, and very variable. Of the named forms I have collected *R. scabriuscula*, Sm., at Applecross and Ullapool; the var. *R. sylvestris*, Woods, at Kinlochewe and Ullapool; var. *cuspidatoides*, Lej., at Achnashellach. The latter collected by Rev. H. E. Fox in 1893.

* *R. CANINA*, L.—The aggregate plant is common in the low lands. Of the named British forms I have gathered *R. lutetiana*, Lem., in many localities. The flowers of this and other varieties of the dog rose are often darker than our Midland plants. *R. dumalis*, Bechst., see Rep. of Rec. Club (Linton, Bailey), Gairloch and Strome Ferry. It is one of the common forms of the non-cristate *canina*. I noted it in 1880 at Loch Alsh, in 1887 at Kinlochewe, and this year I found it commonly at Ullapool. *R. urbica*, Lem.—Applecross and Strathcarron. *R. tomentella*, Lem.—Ullapool. *R. glauca*, Vill.—Common and variable. M. Crepin writes to me, "that *R. glauca* and *R. coriifolia*, Fries., have not been sufficiently studied in Britain. These two secondary species may be met with at lower levels, but they prefer higher situations or else more or less northern lands. A complete series of their variations will doubtless be found in Scotland." A plant which, in the opinion of our British authorities, would be called var. *subcristata*, M. Crepin refers to *R. glauca*, of which he considers it to be a form with compound teeth, and smooth sepals. A conspicuous rose at Applecross, which is, I think, a distinct variety from any of our named forms, M. Crepin says is a variety of *R. glauca*, with simple teeth and glandular pedicels and sepals. It may be worth distinguishing as var. *glandulosa*. *R. coriifolia*, Fries.—This is a common Ross rose. A very pubescent form occurred at Ullapool; in fact, were it not for its subcristate sepals, it would now come under *R. tomentella*, according to our insular ideas. M. Crepin keenly remarks "that as we go northwards forms of *R. canina* are replaced by forms of *R. glauca* and *R. coriifolia*." A very curious rose from Ullapool, which I half thought might be a form of *R. decipiens*, is

commented on by Rev. Moyle Rogers thus: "This puzzles me greatly. Can it be *R. Bakeri*, which I do not understand? The strongly hooked prickles seem against it. Those long, narrow leaflets seem to me to put *decipiens* out of court." M. Crepin would rather refer it to *R. coriifolia*, of which he "thinks it is a form with pubescent petioles, and slightly glandular pedicels." In the Rep. Rec. Club, 1884-86, Mr. C. Bailey records *R. marginata*, Wallr., from opposite the hotel at Gairloch. This is probably not correct, since the true *marginata*, which is a hybrid of *R. gallica*, is not likely to be British. It is doubtful whether we have the true plant in Britain. The var. *Watsoni* occurred at Jeantown.

* *R. RUBIGINOSA*, L.—Kinlochewe and Applecross. I am not quite convinced of the indigenuity of this rose in the county.

(PYRUS ARIA, Sm.—In Dixon's list, erroneously named, or planted. Davidson says it is rare by Loch Carron.)

* *P. AUCUPARIA*, L.—Native; not uncommon. Strome, Kinlochewe, etc.

* *P. MALUS*, L.—Strome, Dundonnell, etc.; possibly native.

* *CRATAEGUS OXYACANTHA*, L.—Possibly native. Dornie, Jeantown, Applecross.

* *SAXIFRAGA OPPOSITIFOLIA*, L.—Rare. A Glas-bheine, in Kintail, Ben Eay.

* *S. STELLARIS*, L.—Rather common, as on the Slioch, Sgurr Fhuaran, Meall Gorm, and An Teallach. A very large form on the rocky bed of a stream which descends from Ben Eay. On Sgurr na Caorach a form was found similar to the plants met with on Aonach Mhor in Westernness, that is with a leafy stem and without the basal rosette of leaves. As in the former case it was associated with *Epilobium alpinum*, and *Bartramia*. It is a form, not a variety, induced by shade and the drip from moist overhanging rocks.

* *S. AIZOIDES*, L.—Abundant, and usually as the plant with ciliate leaves (*S. autumnalis*, L.). Flowers with various tints of orange have been seen, but the dark orange-brown flowered plant which is found in Norway has not been observed.

* *S. HYPNOIDES*, L.—Rather rare. On A Glas-bheine, and on Meall Gorm. I also saw this plant in a rocky piece of ground opposite the mansion-house of Kishorn, where it was probably planted.

* *CHRYOSPLENIUM OPPOSITIFOLIUM*, L.—Not rare, Loch Beag side, Talladale, Applecross, Jeantown, etc.

(*C. ALTERNIFOLIUM* L.—In Dixon's list only.)

* *PARNASSIA PALUSTRIS*, L.—Moilan, Gairloch.

: *RIBES GROSSULARIA*, L.—Strome, Jeantown, etc., not native.

: *R. RUBRUM*, L.—Near Ullapool; an escape from cultivation.

: *R. NIGRUM*, L.—Near Braemore; sown by birds, but fruiting freely.

SEDUM ROSEUM, Scop. (*RHODIOLA ROSEA*).—Plentiful on the precipices about the Falls of Glomak, also seen on mountains in Strathcarron, on An Teallach, in the Beallach na bo Pass, and on Slioch. Davidson says it occurs on Baiois Rhein, Gairloch.

S. TELEPHIUM, L.—“Not common, Gairloch” (Davidson). A doubtful native.

S. ANGLICUM, L.—Common on the low rocks near the sea. Davidson says it is rare at Gairloch.

* *S. ACRE*, L.—Kinlochewe, and certainly native at Applecross, where a large form was seen.

: *S. REFLEXUM*, L.—In a rocky plantation opposite the mansion-house of Kishorn. This and *S. glaucum* (whatever that may be) are given in Dixon's list.

* *DROSER A ROTUNDIFOLIA*, L.—Abundant, and in the sunny summer of 1893 in plentiful flower.

* *D. OBOVATA*, Mert. and Koch.—In several localities in Glen Torridon, by Loch Coulin, Loch Maree, and in Kintail. I now think it is a hybrid of *D. rotundifolia* and *anglica*.

D. ANGLICA, Huds.—Gairloch (Davidson). Rather common in the wetter bogs, and in many places even more plentiful than *D. rotundifolia*, and, like that plant, profusely flowering in 1893.

(*D. LONGIFOLIA*, L. = *D. INTERMEDIA*, Hayne. — The reference in “Scottish Naturalist,” 1891, p. 186, to the occurrence of this species is a misprint for *D. obovata*.)

* *MYRIOPHYLLUM ALTERNIFOLIUM*, DC.—Loch Maree,

River Carron, Loch Coulin, Loch Achall, and common in most of the fresh water lochs.

(*CALLITRICHE VERNA*.—A misnomer in the Applecross list.)

* *C. STAGNALIS*, Scop.—Common; and as the var. *platycarpa*.

* *C. HAMULATA*, Kuetz.—In a pool near Loch Alsh; a drawn-out form in Loch Achall; in a pool near the summit level of the Beallach na bo Pass, at about 2000 feet; and as a small condensed form in Loch a Mhuilinn.

EPILOBIUM ANGUSTIFOLIUM, L.—Given in the Applecross list, and also in Dixon's list of Gairloch plants. On the Cnochan rocks, undoubtedly native.

* *E. PARVIFLORUM*, Schreb.—On the limestone pavement, and in other places about Applecross; and about Kishorn, also on limestone.

* *E. MONTANUM*, L.—Not uncommon; and as the var. *minor*, Haussn., at Kinlochewe and Inverlael; and as the hybrid *E. montanum* \times *obscurum* at Kinlochewe and Ullapool.

* *E. OBSCURUM*, Schreb.—Not rare. Strome, Kishorn, Kinlochewe, Dundonnell, Braemore, etc.; and rather common about Applecross as the upright plant, which suggests *E. tetragonum*; also as the hybrid *obscurum* \times *palustre* at Applecross and Kinlochewe. *E. obscurum* \times *parviflorum* was also seen at Kinlochewe.

* *E. PALUSTRE*, L.—Abundant, and as the var. *fontanum*, in the Beallach na bo Pass.

E. ALPINUM, L.—Rather rare. Mountains near Little Loch Broom (Dr. Lightfoot). I saw it on An Teallach, and in the Beallach na bo Pass, on the Slioch, and on Ben Eay and Lieuthgoch.

(*E. ALSINÆFOLIUM*, Vill.—Given in Dixon's list, and I have an impression that I saw it on Ben Eay, but it should be verified.)

CIRCÆA ALPINA, L.—At the foot of the mountains about Loch Broom (Dr. Lightfoot). Still there, and not unfrequent by Loch Maree, on the sea beach at Applecross, about Dundonnell, and in Strathcarron. On the shore of Loch Maree it was very dwarfed.

* *HYDROCOTYLE VULGARIS*, L.—Not at all common. By Loch Maree, and as the floating form. In 1893 I only noticed it at Applecross.

* *SANICULA EUROPEA*, L.—Strome, Loch Maree side, Ullapool, Jeantown, Applecross, etc.

: *ÆGOPodium PODAGRARIA*, L.—Near habitations at Jeantown, Ullapool, and Applecross.

APIUM NODIFLORUM, Reichb.—Gairloch (Davidson).

* *CONOPODIUM DENUDATUM*, Koch.—Locally common.

: *MYRRHIS ODORATA*, Scop.—In Dixon's list, how far naturalised I cannot say, as I have not seen it in the county.

* *CHÆROPHYLLUM TEMULUM*, L.—Rare. Loch Duich side, and near Jeantown, a doubtful native.

CICUTA VIROSA, L.—Glen Shiel (Davidson). I saw *Enanthe crocata* there; but *Cicuta* occurs in the Hebrides, so the record may be correct.

* *SCANDIX PECTEN-VENERIS*, L.—Colonist, or perhaps not more than a casual. A few specimens near Strathcarron. Dixon gives it in his list.

* *ANTHRISCUS SYLVESTRIS*, Hoffm.—Very local. So far as my observation goes, it is confined to the limestone of Kishorn and Applecross. Dixon gives it in his list, but I have not seen it by Loch Maree.

(*CRITHMUM MARITIMUM*, L.—Given, like so many other plants in Dixon's list, on, I am afraid, very slender evidence. Probably *Salicornia* was meant.)

* *ENANTHE CROCATA*, L.—Local. Loch Duich and Loch Alsh, near Ullapool, and at Applecross and Kishorn not unfrequent.

(*CE. LACHENALII*, Gmel.—Gairloch (Davidson).)

* *ÆTHUSA CYNAPIUM*, L.—Colonist or casual. Rare. Between Jeantown and Strathcarron, and at Kishorn. In Dixon's list.

(*MEUM ATHAMANTICUM*, Jacq.—Only in Dixon's list.)

LIGUSTICUM SCOTICUM, L.—Given in the Applecross and Gairloch lists. I only saw it on a small tract of sand near Polglas, in Coigach.

* *ANGELICA SYLVESTRIS*, L.—Common, and widely distributed.

* *HERACLEUM SPHONDYLIIUM*, L.—Attadale, Applecross, etc.

- *DAUCUS CAROTA*, L.—In the Applecross list. It is apparently scarce. I saw it on the small tract of sand

near Polglass. It is probably the *D. maritimus* of Mr. Dixon's list.

* *CAUCALIS ANTHRISCUS*, Huds.—About Jeantown and Applecross; rare.

* *HEDERA HELIX*, L.—Rare. On the Slioch, Strathcarron. Native.

(*LINNÆA BOREALIS*, L.—In one of the islands in Loch Maree (Davidson). Needs confirmation.)

: * *SAMBUCUS NIGRA*, L.—Strome, Jeantown, etc.; a very doubtful native.

* *VIBURNUM OPULUS*, L.—Seen by me at Strome and Kinlochewe in 1880, but accidentally omitted from my list. Recorded in ed. ii. of "Topographical Botany" on the authority of Mr. Stables. I have seen it near Ullapool, Applecross, and Kishorn.

* *ADOXA MOSCHATELLINA*, L.—Very rare. Cnochan rocks, 1894.

* *LONICERA PERICLYMENUM*, L.—On the slopes of Slioch, at Ullapool, Strathcarron, etc. Not uncommon.

CORNUS SUEGICA, L.—Loch Broom mountains (Lightfoot), plentiful on Slioch, also on An Teallach and in Strathcarron.

GALIUM BOREALE, L.—"Topographical Botany" (G. C. Smith).—Sgurr Fhuaran, Beallachnabo, An Teallach, Ben More, Rhidorroch, etc.

* *G. VERUM*, L.—Local, and absent from a large area of the county. It was not unfrequent on the shingle at Ullapool, at Applecross, and in a few localities at Strathcarron. On the limestone near Loch Achall, and at Kishorn.

* *G. HERCYNICUM*, Weig. (*G. saxatile*, L. Sp. Pl. ed. ii., not of ed. i.).—Very common. An unusually large form at Dundonnell.

: * *G. ERECTUM*, Huds.—In a grass field near Strathcarron; possibly introduced with grass seeds.

* *G. PALUSTRE*, L.—Rather common. Var. *Witheringii*, Sm., at Braemore, etc. A small, thick-leaved form occurred on shingle at Torridon; it is probably the var. *microphyllum*, Lange.

(*G. ULIGINOSUM*, L.—In Dixon's list.)

* *G. APARINE*, L.—Rather rare. Strome, Ullapool, Applecross.

* *ASPERULA ODORATA*, L.—Strome, Ullapool, Jeantown, Dundonnell.

SHERARDIA ARVENSIS, L.—Strome Ferry (E. F. Linton). Probably a colonist or casual. Also at Kinlochewe. See Journ. Bot., 1888, p. 21, as the type plant, not the var. *Wallravenii*.

(*VALERIANA DIOICA*, L. — In Dixon's list. Almost certainly an error.)

* *V. OFFICINALIS*, L.—Common as the var. *sambucifolia*. It is especially abundant about the ravine of Braemore, and is also found at a considerable elevation on mountain cliffs.

* *SCABIOSA SUCCISA*, L.—Common, and generally distributed, ascending to nearly 3000 feet.

(*S. COLUMBARIA*, L.—Given in the Applecross and in Dixon's list of Gairloch plants; in both cases probably a misnomer.)

: *S. ARVENSIS*, L.—Very rare, and probably a casual or colonist, as at Dornie and Kinlochewe.

* *SOLIDAGO VIRGAUREA*, L.—Abundant, and generally distributed. The var. *cambrica* (Huds.) is also frequent. The var. *angustifolia*, Gaudin, also occurs, as on Slioch, and in very fine condition by the river at the head of Loch Broom.

* *BELLIS PERENNIS*, L.—Not uncommon.

* *ASTER TRIPOLIUM*, L.—Loch Torridon (Journ. Bot., 1888, p. 21), Strathcarron, Jeantown, and Applecross. One or two specimens of the form *discoidea* also were seen.

ANTENNARIA DIOICA, Br. ("Topographical Botany," Ch. Babington).—Not uncommon. The var. *pedicellata* occurred on mountains by Strathcarron, etc.

* *GNAPHALIUM ULIGINOSUM*, L.—Rare. Kishorn.

* *G. SYLVATICUM*, L.—Courthill, Kishorn. Rare.

* *G. SUPINUM*, L.—Not common. On Sgurr Fhuaran, Beinn Fhada, Beallach na bo, Beinn Eigh.

* *ACHILLEA MILLEFOLIUM*, L.—Common, and generally distributed. The var. *rubra* at Kishorn, and a very downy form in Glen Bianasail.

* *A. PTARMICA*, L.—Common, and widely distributed.

* *CHRYSANTHEMUM SEGETUM*, L.—Locally abundant in corn fields, but probably introduced at no very distant period.

* *C. LEUCANTHEMUM*, L.—Not common. Attadale, Ullapool, Applecross, and Kishorn, etc.

* *MATRICARIA INODORA*, L.—Common, and as a very large flowered plant.

(*M. CHAMOMILLA*, L.—Given in Dixon's list.)

: *TANACETUM VULGARE*, L.—Side of Gairloch (Dr. Lightfoot). Given in Dixon's list. I saw it as a garden escape at Jeantown.

(*ANTHEMIS MARITIMA*, L., is given in Dixon's list; probably *Matricaria inodora* was intended.)

(*ARTEMISIA ABSINTHIUM*, L.—Given in the Applecross list, but very likely *A. vulgaris* was mistaken for it. If the former really occurred it was not a native.)

* *TUSSILAGO FARFARA*, L.—Not common. Kinlochewe, Dundonnell, Ullapool, Kishorn, etc.

* *PETASITES OFFICINALIS*, Moench.—Rare. South side of Loch Duich.

: *DORONICUM PARDALIANCHES*, L.—Shiel. A garden straggler.

* *SENECIO VULGARIS*, L.—Not common. Kinlochewe, Ullapool, Jeantown, etc.

* *S. SYLVATICUS*, L.—Local and rather rare. Often on cottage roofs at Ullapool and Jeantown.

* *S. JACOBÆA*, L.—Very common. A short-rayed form also occurred.

* *S. AQUATICUS*, Huds.—Common.

(? *ARCTIUM MAJUS*, Schk.—In the Applecross list. My Torridon plant was a form of *intermedium*.)

* *A. INTERMEDIUM*, Lange.—Kinlochewe, Torridon, and Jeantown.

* *A. MINUS*, Schk.—Mollan, Ullapool, Jeantown.

(*CARDUUS NUTANS*, L.—In Dixon's list. Probably an error.)

* *CNICUS LANCEOLATUS*, Willd. Abundant. The var. *nemorale*, Reichb., occurred at Kinlochewe.

* *C. PALUSTRIS*, Willd.—Abundant. Sometimes with whitish flowers.

C. HETEROPHYLLUS, Willd.—Not very common. Loch Maree side, Ullapool, etc. See "Top. Bot.," ed. i.

* *C. ARVENSIS*, Willd.—Common, and occasionally with white flowers. The var. *mitis*, Koch., was seen at

Jeantown, and the var. *horridus*, Koch., at Strathcarron, Kishorn, etc.

SAUSSUREA ALPINA, DC.—Rare. On Sgurr Fhuaran, Sgurr na Caorach. No personal authority for this plant is given in "Topographical Botany." The flowers have a powerful heliotrope odour.

* CENTAUREA NIGRA, L.—Common, and widely distributed.

* C. CYANUS, L.—Rare, and perhaps only a casual. Kinlochewe. Dixon gives it in his list of Gairloch plants.

* LAPSANA COMMUNIS, L.—In scattered localities through the county, and indubitably native. A more pubescent form was found on the shingle at Ullapool.

* CREPIS VIRENS, L.—Strome, Ullapool, Applecross, etc. The var. *agrestis*, Kit., occurred at Ullapool and Jeantown. Dixon gives *C. tectorum*, L., as well as *C. virens* in his list, but *C. tectorum* is not a British plant.

* C. PALUDOSA, Moench.—Common, and widely distributed.

* HIERACIUM PILOSELLA, L.—Not common. North side of Loch Duich.

* H. MELANOCEPHALUM, Tausch. (*H. alpinum*, L.).—Ben Eay. Rare. The specimens were much over flower.

* H. HOLOSERICEUM, Backh.—Rare. Ben Eay.

(? * H. GLOBOSUM, Backh.—Some specimens of apparently this species occurred on Ben Eay, but they were too far gone over to be identified with certainty.)

* H. CHRYSANTHUM, Backh.—On Ben Eay, Sgurr Fhuaran, An Teallach, etc.

* H. EXIMIUM, Backh., var. TENELLUM, Backh.—Ben Eay. Rare. Specimens much gone over, of what were probably the type plant, were seen on Ben Eay.

* H. LINGULATUM, Backh.—A rather frequent montane hawkweed, as on Ben Eay, the Slioch, An Teallach, Meall Gorm, Sgurr na Caorach, etc. It reached nearly 3000 feet on the Slioch.

* H. NIGRESCENS, Willd.—Ben Eay and the Slioch.

* H. ANGLICUM, Fr.—Common on the mountains, and in the ravines in sub-alpine districts. Var. *longibracteatum*, Hanb.—Loch Broom side near Ullapool, and Beallach na bo.

* H. IRICUM, Fr.—Apparently rare or local, and only

noticed by me on the limestone, as at Kishorn; by the river in the limestone gorge at Ullapool; and on the Cnochan rocks.

(? *H. PALLIDUM*, Fr.—A plant, in seed, of what is probably this species was seen by the river north of Ullapool.)

* *H. MURORUM*, L.—Not uncommon, as at Strome, Ullapool, Braemore, Dundonnell, Kishorn, Jeantown, etc. A very handsome form occurred by the ravine of Braemore. Var. *ciliatum*, Almq.—Beallach na bo Pass.

* *H. CAESIUM*, Fr.—Sgurr Fhuaran. The specimen was so named by Boswell Syme.

* *H. VULGATUM*, Fr.—Abundant, and generally distributed.

* *H. RUBICUNDUM*, Hanb.—Near Ullapool.

* *H. DURICEPS*, Hanb.—Strathcarron, but scarcely typical.

* *H. SPARSIFOLIUM*, Lindb.—Rare. By the river Broom at the head of Loch Broom; and the form with blotched leaves "*f. aberrans cruentata*."

* *H. CROCATUM*, Fr.—North side of Loch Duich, near Loch Torridon.

* *H. AURATUM*, Fries.—Banks of the river at Ullapool, and by the river Carron.

* *H. RETICULATUM*, Lindb.—Rare. By the river at Ullapool.

* *H. EUPATORIUM*, Griseb.—By the stream at Applecross, a form approaching *H. reticulatum*.

* *H. PRÆLONGUM*, Lindb.—Rare. By a stream near Kinlochewe.

* *HYPOCHÆRIS RADICATA*, L.—Abundant and variable. As I came down the Beallach na bo Pass, I saw across the bay of Kishorn a bright band of yellow flowers below the mansion-house; since I could not understand what it was I visited the place, and found it to be caused by a quantity of *Hypochæris*, which grew at the junction of the limestone with a bed of clay.

* *LEONTODON AUTUMNALIS*, L.—Abundant; var. *pratensis*, Koch., also common. A form with deeply cut leaves occurred by the roadside near Broom and also at Dundonnell. The form with woolly involucres is by no means confined to the mountains, it grew by the sea near Ullapool. The alpine form, with black, woolly involucres, is common on the higher mountains.

* *TARAXACUM OFFICINALE*, Web.—Common. Var. *palustre*, DC., not unfrequent.

* *SONCHUS OLERACEUS*, L.—Loch Carron side, Kinlochewe.

* *S. ASPER*, All.—A very prickly form grew on the shingle at Ullapool, it is probably the var. *pinnatifidus*, Peterm.

* *S. ARVENSIS*, L.—Rare, and probably only a colonist. Dornie and Dundonnell.

LOBELIA DORTMANNA, L.—See “Topographical Botany.” Not rare in the lochs, as Achall, Clare, etc.

(? *WAHLENBERGIA HEDERACEA*, Reichb.—Given as a doubtful native in Dixon’s list. Was it rightly named?)

(*CAMPANULA RAPUNCULOIDES*, L.—Included in Dixon’s list.)

* *C. ROTUNDIFOLIA*, L.—Very rare, and local. Kintail, v. s. Not seen about Ullapool, Strathcarron, or Applecross.

* *VACCINIUM OXYCOCCOS*, L.—Very rare, moorland above Loch Long. The cranberry is given in Dixon’s list.

* *V. VITIS-IDÆA*, L.—Not uncommon, as on the lower slopes of Slioch, Ben More, Braemore, etc. This is the “cranberry” of northern Scotland.

V. ULIGINOSUM, L.—Loch Broom mountains (Lightfoot). On Sgurr Fhuaran, An Teallach, in good flower, Ben Eay, Meall Gorm, and probably occurs on most of the higher mountains.

* *V. MYRTILLUS*, L.—Not uncommon.

ARCTOSTAPHYLOS ALPINA, Spreng.—“To the south of Little Loch Broom, and between that lake and Loch Mari, Coygach, Bennaish” (Lightfoot). I have found this plant in many situations between 1600 and 2000 feet on the rather bare and exposed shoulders of mountains, as on Ben Eay, An Teallach, and on the mountains on the northern side of Strathcarron, where it was very profuse on one ridge at about 2000 feet, but quite burnt up by the hot sun of the abnormal year 1893; it was associated with *Loiseleuria procumbens*.

* *A. UVA-URSI*, Spreng.—Lieuthgoch, Ben Eay, Slioch, An Teallach, etc. Var. *angustifolia*, a form with much narrower leaves, occurred on An Teallach.

* *CALLUNA ERICA*, DC.—Too abundant; ground covered with heather or bracken afford little variety of plants to

the botanist. The var. *incana* also occurs. The form with white flowers was rather common on the lower slopes of Ben Eay and in one of the Summer islands.

* *ERICA TETRALIX*, L.—Abundant on the moorlands and bogs, also with white flowers.

* *E. CINEREA*, L.—Common, rarely with white flowers, as in Glen Torridon.

LOISELEURIA PROCUMBENS, Desv.—“Topographical Botany;” see also Murray’s “Northern Flora, Hills of Ross-shire” (G. C. Smith). It is rather frequent on the higher hills, as Sgurr Fhuaran, An Teallach, etc.

* *PYROLA MEDIA*, Sw.—Glenelg, v. sp.

P. MINOR, L. (“Topographical Botany”).—Doubtless on the authority of Lightfoot, who records it from Little Loch Broom. Dixon includes it in his list.

P. SECUNDA, L.—Recorded by Lightfoot “from a wood called Ca-buch . . . , near Little Loch Broom, and about Loch Mari.” I found it on some limestone rocks by the river Ullapool.

* *ARMERIA MARITIMA*, Willd.—Common on the coast in many places, also on the higher hills, as Meall Gorm, An Teallach. A small, narrow-leaved form was seen near Applecross, but it was not *A. sibirica*, Turc. On the Slioch the var. *planifolia* occurred.

* *PRIMULA ACAULIS*, L.—Not unfrequent in the wooded straths.

* *LYSIMACHIA NEMORUM*, L.—Loch Maree side, Braemore, Applecross, Dundonnell, etc.

TRIENTALIS EUROPÆA, L.—Mentioned in Dixon’s list. It is a plant which is very likely to be found, but it must be very local, as so far it has eluded me. My journeys have been made rather late in the year.

* *GLAUX MARITIMA*, L.—In many places on the coast, as by Loch Torridon, Loch Carron, Applecross, and Ullapool.

ANAGALLIS TENELLA, L.—Given in the Applecross and Gairloch lists. It must be local, since I have not observed it.

* *FRAXINUS EXCELSIOR*, L.—Not rare, and undoubtedly native.

: *LIGUSTRUM VULGARE*, L.—Probably planted, as at Strome, etc.

* *GENTIANA AMARELLA*, L. ("Topographical Botany").—Apparently rare. On the limestone near Loch Dearg as a branched form, the f. *multicaulis*, Lange.

* *G. CAMPESTRIS*, L.—Local and rare. Near Loch Torridon.

* *MENYANTHES TRIFOLIATA*, L.—Loch Maree, Ullapool, Applecross, etc.

(? *SYMPHYTUM OFFICINALE*, L.—Given in the Applecross list; if correctly named it is probably only an escape from cultivation.)

: *S. PEREGRINUM*, Led.—The fodder plant which has been thus named occurred as a straggler from cultivation near Inverlael.

* *LYCOPSIS ARVENSIS*, L.—In cultivated ground at Dundonnell and Ullapool.

* *MERTENSIA MARITIMA*, Gray.—Side of Loch Duich, v. s. Given in Dixon's list.

* *MYOSOTIS MARITIMA*, Fries. (*M. caespitosa*, Schultz.).—Common.

M. REPENS, Don.—Near Kinlochewe (C. Bailey, in the Rep. of Record Club, 1883). Strathcarron, Applecross, Duncraig.

(? *M. PALUSTRIS*, With., is given in the Applecross list. It may possibly be correct, but more likely is a misnomer for *M. caespitosa* or *M. repens*.)

* *M. SCORPIOIDES*, L. (*M. arvensis*, Roth.).—Kinlochewe, Ullapool, Applecross, Jeantown, etc.

* *M. COLLINA*, Roth. (*M. hispida*, Schlecht.).—Kinlochewe, Ullapool.

* *M. VERSICOLOR*, Roth.—Not uncommon. The var. *Balbisiana*, Jord., with all the flowers yellow, occurred at Lubavadie.

: *VOLVULUS SEPIUM*, Jung.—On the shingle about Jeantown, principally as the var. *colorata* (Lange). Most likely of garden origin.

: *ATROPA BELLADONNA*, L.—Given in Dixon's list. It is stated in Anderson's "Guide to the Highlands and Islands of Scotland" to grow in one of the islands in Loch Maree. It is not native.

: *LINARIA CYMBALARIA*, L.—On a wall in Ullapool, planted.

(SCROPHULARIA AQUATICA, L.—Given in Dixon's list; doubtless an error.)

* S. NODOSA, L.—Achnashellach, Kinlochewe, Inverlael, Applecross, Dundonnell, Duncraig, etc.

: MIMULUS LUTEUS, DC.—In the Gairloch list. The var. *guttatus*, DC., I found by a small stream near Lienassie, and not near any houses.

* DIGITALIS PURPUREA, L.—Widely distributed.

(VERONICA HEDERÆFOLIA, L.—Given in Dixon's list. So far I have not seen it.)

* V. DIDYMA, Ten. (*V. polita*, Fries.). — Jeantown. Colonist or casual.

* V. AGRESTIS, L.—Kinlochewe, near Ullapool, in the latter locality in two forms.

* V. ARVENSIS, L.—Rather rare. Loch Broom side, Kinlochewe, Strome.

* V. SERPYLLIFOLIA, L.—Not uncommon.

* V. HUMIFUSA, Dicks.—A Glas-Bheine. Also on the Slioch.

* V. OFFICINALIS, L.—Glen Docharty, Kishorn, Braemore, not uncommon.

* V. CHAMÆDRYS, L.—Common.

* V. SCUTELLATA, L.—Loch Clare, Ullapool, Applecross, etc., but always as the glabrous plant.

* V. ANAGALLIS-AQUATICA, L.—Rare. Only noticed at Kishorn, near Courthill, as the var. *anagalliformis*, Boreau, which has the inflorescence covered with glandular hairs.

* V. BECCABUNGA, L.—Rather rare. Dornie, Ullapool, Jeantown, and Applecross. The flowers appear to be rather deeper in tint than those of the Midland plant.

* EUPHRASIA OFFICINALIS, L.—The aggregate plant is common. Var. *Rostkoviana*, Hayne, f. *borealis*, Townsend.—Glen Torridon, Ullapool, Applecross, etc. Koch in Synopsis Fl., Germ., ed. ii, reduced *E. Rostkoviana* to var. *pratensis*. Var. *gracilis*, Fries.—Glen Bianasdail, also at Slattadale (see Rep. of Rec. Club (C. Bailey), 1883).

* BARTSIA ODONTITES, Huds.—Loch Duich, Jeantown, Applecross, and Kishorn. Local, and always as the var. *Odontites verna*, Reichb.

* PEDICULARIS PALUSTRIS, L.—Common.

* P. SYLVATICA, L.—Common. I saw it flourishing on

the turf-covered top of a wall by Braemore. The white-flowered form was not uncommon on the moorland near the Falls of Glomak.

MELAMPYRUM PRATENSE, L.—Loch Maree side, Braemore, Dundonnell, Drumroonie, etc., but not so common in Western Ross as in some of the other Scotch counties. The var. *montanum*, Johnston, occurred on An Teallach, etc.

(? *M. SYLVATICUM*, L.—Doubtfully recorded by me from a wooded rock near Strome, but it may have been a yellow-flowered form of *M. pratense*, i.e. var. *hians*. Dixon records it in his list of Gairloch plants.)

* *RHINANTHUS CRISTA-GALLI*, L.—Not uncommon, and usually as the var. *angustifolia*, Koch. The mountain form, var. *Drummond-Hayi*, Buch. White, occurred on the Slioch, An Teallach, etc.

OROBANCHE RUBRA, Sm. (*O. Epithymum*, DC.).—In an island near the mainland at Gairloch (Bowman) in "New Botanical Guide." It is included in the Gairloch list.

* *UTRICULARIA NEGLECTA*, Lehm. — Rare. In Loch a Mhuilinn.

* *U. MINOR*, L.—With the above, not in flower.

U. INTERMEDIA, Hayne.—In "Topographical Botany" (Churchill Babington). I saw it in Glen Torridon.

* *PINGUICULA VULGARIS*, L. — Common. The var. *alpicola*, Reichb., which is a very large-flowered form with more contiguous petals, occurred on the north-western slopes of A Glas-bheine, in Kintail. Boswell Syme said he had never seen any British specimen like it before.

P. LUSITANICA, L.—Recorded in Hooker's "Flora Scotica" and "New Botanical Guide." It is not rare. It occurs in Gairloch, Kintail, Ullapool, etc.

(*MENTHA LONGIFOLIA*, Huds. (*M. sylvestris*, L.), is given in Dixon's list. An almost certain error.)

: *M. VIRIDIS*, L.—On the beach at Jeantown as an out-cast from gardens.

(*M. PIPERITA*, Huds. — Another misnomer, which is recorded in the Gairloch list.)

* *M. HIRSUTA*, Huds.—Glen Docharty, Ullapool, Applecross, Kishorn, etc.

* *M. SATIVA*, L.—Rare. Applecross. It is given in Dixon's list, but probably not correct.

* *M. ARVENSIS*, L.—Loch Duich side. Rare.

* *LYCOPUS EUROPÆUS*, L.—Kintail, 1880.

* *THYMUS SERPYLLUM*, L.—Common, and generally distributed. The so-called var. *prostatum*, Hornem., Glen Torridon, 1886 (teste, Mr. Arth. Bennett). I saw it in the Beallach na bo Pass, it is probably not uncommon.

(*NEPETA CATARIA*, L.—Another of the misnomers of the Gairloch list).

* *N. GLECHOMA*, Benth.—Ullapool, Applecross, Dundonnell, not common.

* *SCUTELLARIA GALERICULATA*, L.—Strome, Jeantown, and Applecross. The flowers are rather more brightly blue than those of our Midland plant, the calyx is densely hairy.

* *PRUNELLA VULGARIS*, L.—Common. The flowers are distinctly larger than those of our Midland plants.

* *STACHYS PALUSTRIS*, L.—Not uncommon. The var. *canescens*, Lange., occurred at Kinlochewe and Ullapool, in corn fields.

S. AMBIGUA, Sm.—Near Jeantown (Hooker's "Flora Scotica"). I gathered it in very fine condition in Jeantown, growing with both the assumed parents, in 1893.

* *S. SYLVATICA*, L.—Not common. Kinlochewe, Applecross, and Jeantown.

S. ARVENSIS, L.—Found by Mr. Ewing in 1887. It was rather plentiful in a few corn fields and garden ground at Ullapool.

GALEOPSIS SPECIOSA, Mill.—Discovered by Churchill Babington, and included in Dixon's list, but I have not seen it in the county.

* *G. TETRAHIT*, L.—Dornie, Kinlochewe, Ullapool, Dundonnell, Applecross, Jeantown, etc. The var. *bifida*, Boenn., is also not rare, or rather is the prevailing plant.

* *LAMIUM AMPLEXICAULE*, L.—Rare. Coulna Craig, Ullapool.

* *L. INTERMEDIUM*, Fries.—Not uncommon.

* *L. PURPUREUM*, L.—Rare. Dornie, Strathcarron. Dixon also includes it in his list.

(*L. ALBUM*, L.—Given in Dixon's list, but probably a misnomer—a white-flowered form of *intermedium* may have been mistaken for it).

* *TEUCRIUM SCORODONIA*, L.—Common.

* *AJUGA REPTANS*, L.—Not uncommon. Kinlochewe, Strathcarron, Jeantown, Applecross, etc.

(*A. PYRAMIDALIS*, L.—Given in Dixon's list, and it is a likely plant to occur).

* *PLANTAGO MAJOR*, L.—Common, often as the var. *P. intermedia*, Gilib.

* *P. LANCEOLATA*, L.—Common and variable. As the var. *capitata*, Presl., and var. *repens*, Lange, on rocks near Jeantown; and the var. *criophylla*, Dcne.

* *P. MARITIMA*, L.—Common, not only by the coast, but also inland, and ascending to a considerable height on the hills. Two or three forms occur, one of them the var. *pygmæa*, Lange.

P. CORONOPUS, L. — Found by Mr. Ewing in 1887; it is also included in the Gairloch list, but so far I have not met with it.

* *LITTORELLA JUNCEA*, Bergh.—Not uncommon by the loch borders, as in Loch Maree, Mhuilinn, Achall, etc.

* *SCLERANTHUS ANNUUS*, L.—Kinlochewe. Rare, and only a colonist or casual, so far as my observation goes.

* *CHENOPODIUM ALBUM*, L.—Not uncommon in cultivated fields and waste places. The var. *C. candicans*, Lamk. (var. *incanum*, Moq. Tand.), was seen at Ullapool, Strathcarron, etc. The var. *C. paganum*, Reichb. (var. *cymosum*, Chev.), also occurred at Ullapool, Dundonnell, Jeantown, etc.

(? *C. MURALE* and *C. URBICUM*, L., are erroneous records given in Dixon's list.)

* *C. BONUS-HENRICUS*, L.—Rare. Dornie, not far from houses.

* *ATRIPLEX PATULA*, L.—In cultivated ground, as at Jeantown, Ullapool, etc. Var. *angustifolia* (Sm.). Apparently rare, Ullapool.

* *A. HASTATA*, L.—Strome and Ullapool.

* *A. BABINGTONII*, Bab.—Very common as a shore weed, and often as the var. *virescens*, Lange, as at Torridon, Ullapool, Loch Broom.

SALICORNIA HERBACEA, L. — Found by Mr. Ewing in 1887. Plentiful by Loch Carron below Jeantown, also seen at Applecross.

SUEDA MARITIMA, Dum.—Recorded from Loch Broom by Lightfoot as *Chenopodium maritimum*. It also occurs by

Loch Carron as the var. *erecta*, Moq. Tand., and as the var. *vulgaris*, Moq. Tand. The latter is the more frequent form. Applecross, Kishorn, and Little Loch Broom also yield it.

(SALSOLA KALI, L.—Given in Dixon's list, and very likely to occur.)

* POLYGONUM CONVULVULUS, L.—Rare, and little more than a casual. Kinlochewe. It is also marked in Dixon's list.

* P. AVICULARE, L.—Not uncommon. The varieties *agrestinum*, *vulgatum*, *arenastrum*, *rurivagum*, and *litorale* have been noticed by me in the county.

(P. MARITIMUM, L.—Is given in Dixon's list, evidently in error, a maritime form or variety of *aviculare* having doubtless been mistaken for it.)

* P. HYDROPIPER, L.—Rather common.

* P. PERSICARIA, L.—Widely distributed.

* P. LAPATHIFOLIUM, L.—In several corn fields, as at Ullapool, Dornie, Kinlochewe, Jeantown, Applecross, etc.

* P. AMPHIBIUM, L.—Rare. The land form at Dornie alone noticed.

P. VIVIPARUM, L.—Given in Dixon's list, but this common plant of sub-alpine pastures I did not see till 1894, when I found it on the Cnochan rocks.

* OXYRIA DIGYNA, Hill.—On many of the higher hills, and often brought down by mountain streams to low levels. I have seen it on Sgurr Fhuaran, An Teallach, Meall Gorm, the Slioch Beinn Eigh (Ben Eay), on the sea-beach at Applecross, and near Duncraig Castle, close to the sea-level.

* RUMEX CONGLOMERATUS, Murr.—Scattered through the county.

* R. OBTUSIFOLIUS, L.—About houses, as at Strathcarron, Jeantown, Dornie, Ullapool, Achnashellach.

* R. ACUTUS, L.—Rare. Strathcarron.

* R. CRISPUS, L.—Common. As the var. *trigranulatus* (Syme), at Jeantown and Ullapool.

* R. DOMESTICUS, Hartm.—Local, occurs in the neighbourhood of the station at Strathcarron, with a plant which is probably *R. propinquus*, Aresch.

* R. CONSPERSUS, Hartm.—Strathcarron.

* R. ACETOSA, L.—Common, and widely distributed.

* *R. ACETOSELLA*, L.—Common, and generally distributed.

* *EUPHORBIA HELIOSCOPIA*, L.—Rare, and only a colonist. Kinlochewe, Dundonnell.

* *E. PEPLUS*, L.—Colonist. Garden ground at Kinlochewe and Strathcarron.

* *MERCURIALIS PERENNIS*, L.—Rare. Kintail.

* *ULMUS CAMPESTRIS*, L. (*U. montana*, Sm.).—Probably native. Loch Duich, Strathcarron, Applecross, and Dundonnell.

* *U. SUBEROSA*, Ehrh.—Planted in many places.

* *URTICA DIOICA*, L.—Usually about houses; widely distributed.

U. URENS, L.—Recorded by Mr. Ewing in 1887. Common about Ullapool and Jeantown.

* *MYRICA GALE*, L.—Common.

* *BETULA ALBA*, L.—Not uncommon. Loch Duich, Kinlochewe, Applecross, etc.

* *B. GLUTINOSA*, Fries. (*B. odorata*, Bechst.).—In the Straths. Var. *parvifolia*, Wimm.—Kinlochewe, Strathcarron, Rhidorroch.

(? *B. NANA*, L.—Loch Glass (Dr. Lightfoot). Loch Glass is, however, in East Ross. It is included in Dixon's list, and is given in "Topographical Botany" without personal voucher.)

* *ALNUS GLUTINOSA*, Gærtn.—Common in the valleys.

* *CORYLUS AVELLANA*, L.—Not common. Strome, Kinlochewe, Loch Broom, etc.

* *QUERCUS ROBUR*, L., var. *FÆMINA*, Mill.—Kinlochewe, Dundonnell, Jeantown, Applecross.

Q. PEDUNCULATA, Ehrh., was not noticed by me, but the oak is so frequently barren in Ross that I may have overlooked this variety.

: *FAGUS SYLVATICA*, L.—Occurs only as a planted tree.

(*SALIX PENTANDRA*, L.—Given in Dixon's list, but I have not observed it.)

: * *S. ALBA*, L.—Occurs as a planted tree at Jeantown, etc.

* *S. RUBRA*, Huds.—Probably as a planted tree. I noticed it at Kinlochewe and Inverlael.

* *S. VIMINALIS*, L.—Possibly native. Strome, Loch Broom, Jeantown, etc.

* *S. SMITHIANA*, Willd.—Loch Broom, but very likely planted.

* *S. RUGOSA*, Leefe.—Probably planted. At Kinlochewe.

* *S. CINEREA*, L.—Common and variable.

* *S. AURITA*, L.—Rather frequent, sometimes as the var. *minor*, Sond.

* *S. CAPREA*, L.—Not uncommon, but much less frequent than *S. cinerea*.

(*S. NIGRICANS*, Sm., is given in Dixon's list, and it may probably be correct, but it evidently is not common, as I have been unable so far to detect it.)

(*S. PHYLICIFOLIA*, L., is given in the Applecross list. I was unable to see it on either of my visits to the county. It had better be queried, since forms of *S. cinerea* are frequently mistaken for it.)

* *S. AMBIGUA*, Ehrh. (*S. aurita* × *repens*).—Rare. Near Kishorn. It is given in Dixon's list, but this Gairloch record will have to be verified.

* *S. REPENS*, L.—Rather scarce. Ben Eay, Kishorn.

S. LAPPONUM, L.—In "Topographical Botany" on the authority of Mr. Campbell. I have not seen it in the vice-county.

S. HERBACEA, L.—Given in "Topographical Botany" without personal authority. It occurs on most of the higher mountains, as Ben Eay, the Slioch, An Teallach, Meall Gorm, and on a mountain in Strathcarron at about 2000 feet, with very much larger leaves.

(*S. RETICULATA*, L.—Included in the Gairloch list, but the record must be verified. *S. aurita* was probably the plant seen.)

* *POPULUS TREMULA*, L.—Native, and widely distributed; and as the var. *glabra*.

*: *P. NIGRA*, L.—Planted, as at Ullapool, Jèantown, Loch Duich, etc.

* *EMPETRUM NIGRUM*, L.—Abundant.

JUNIPERUS COMMUNIS, L.—Given in the lists of Mr. Dixon and Mr. Allan, but I have no memorandum of having seen it in the vice-county.

* *J. NANA*, Willd.—On the Slioch, Ben Eay, Ullapool, Strathcarron, etc., also as a form approaching *J. communis*.

PINUS SYLVESTRIS, L.—Undoubtedly native. Remains

of ancient trees are to be seen in many of the peat bogs. Lightfoot recorded it from Loch Maree in the "Flora Scotica," where it still occurs. This tree probably supplied the ancient iron-works with fuel.

MALAXIS PALUDOSA, Sw.—See "Topographical Botany" without personal authority. In Glen Docharty growing with *Hypnum revolvens*, rather common on the shores of Loch Maree.

CORALLORHIZA INNATA, Br.—"In a moist, hanging wood, on the south side, near the head of Little Loch Broom." (Lightfoot in "Flora Scotica," p. 523).

LISTERA CORDATA, Br.—About Little Loch Broom (Lightfoot). I saw this by Loch Maree and on the limestone near Ullapool, and near Dundonnell in Lightfoot's locality; also at Rhidorroch. *Peramium* appears to be the older generic name.

* L. OVATA, Br.—Not common, and only noticed on limestone, as at Ullapool, Applecross, Kishorn, and Cnochan.

GOODYERA REPENS, Br.—Recorded by Lightfoot as "*Satyrium repens*, growing amongst the Hypna, in an old, shady, moist, hanging birch wood, called Ca-bue or Yellow-hill, facing the house of Mr. Mackenzie, of Dundonald, about two miles from the head of Little Loch Broom."

CEPHALANTHERA ENSIFOLIA, Rich.—Dixon in his list of Gairloch plants states that Dr. Mackenzie, writing of the first quarter of the century, says "the braes and wooded hillocks of Gairloch were a perfect jungle of every kind of loveable shrub and wild flower . . . some of the *Epipactis* tribe being everywhere a lovely drug." "The *Epipactis ensifolia*," says Dixon, "formerly abundant, is now almost unknown. In June 1883 I discovered one plant on a stony bank by water. In 1885 two plants were at the same place."

* ORCHIS MASCULA, L.—Strome, Ullapool, Rhidorroch, Cnochan, and Jeantown.

* O. INCARNATA, L.—Loch Duich, Rhidorroch, etc.

* O. LATIFOLIA, L.—Near the sea at Ullapool, Drum-roonie, Dundonnell.

* O. MACULATA, L.—Abundant. Usually with darker coloured flowers than those of the plant from the Midlands.

(? OPHRYS MUSCIFERA, Huds.—Mr. B. S. Ogle brought a

root of an orchis, which he found near Achnashellach, to his garden in Oxfordshire. He believes a plant of the fly orchis, which has flowered there, to be from the Ross-shire root. Confirmatory evidence of its occurrence in the county is needed.)

(*HERMINIUM MONORCHIS*, Br.—One of the impossible plants of Dixon's list.)

* *HABENARIA ALBIDA*, Br.—Apparently rare. I saw it on the limestone at Ullapool, and rather plentiful near Rhidorroch.

H. CONOPSEA, Reich.—Recorded by Mr. C. Bailey from Gairloch in 1883. I have seen it at Kishorn, Rhidorroch, Cnochan, Strome, etc.

H. VIRIDIS, Br.—Recorded in the Applecross list. I saw it at Ullapool, Cnochan, and Kishorn on the limestone, also a plant with branched spike.

* *H. BIFOLIA*, Br.—Loch Torridon, Strome, Loch Duich, Rhidorroch, Duncraig, Dundonnell, etc.

H. CHLOROLEUCA, Ridley.—Recorded in the Gairloch and Applecross lists. I saw it in grass fields near Dundonnell.

* *IRIS PSEUDACORUS*, L.—Achmore, Ullapool, Kishorn, Applecross, Jeantown, etc.

(*ALLIUM OLERACEUM*, L.—In the Gairloch list, doubtful.)

* *A. URSINUM*, L.—Rare. Strome, on steep rocks by the waterfall at Jeantown, and on the Cnochan rocks.

* *SCILLA NUTANS*, Sm.—Widely distributed.

* *NARTHECIUM OSSIFRAGUM*, L.—Abundant. The flowers have a perfume like the clove-pink.

TOFELDIA PALUSTRIS, Huds. — Recorded in "Topographical Botany." I have seen it on the Slioch and Ben Eay.

* *JUNCUS BUFONIUS*, L.—Common, and as the var. *fascicularis*, Koch.

J. TRIFIDUS, L. — Mountains near Little Loch Broom (Dr. Lightfoot). In "Topographical Botany," without personal authority. It is plentiful on the ridge of Ben Eay, on the Slioch, Ben More, An Teallach, Sgurr Fhuaran, and Meall Gorm. It descends to 1000 feet on a mountain in Strathcarron.

(*J. COMPRESSUS*, Jacq.—Some specimens which I

gathered at Attadale in 1879 were so named by Dr. Boswell Syme, but they were rather young, and I believe them to have been *J. Gerardi*. At anyrate, confirmatory evidence is needed of the occurrence of true *J. compressus* in West Ross.)

* *J. GERARDI*, Lois.—Common on the sides of Loch Carron by the mouth of the river, at Ullapool, at Kishorn, and Dundonnell.

* *J. EFFUSUS*, L.—Widely distributed.

* *J. CONGLOMERATUS*, L.—Abundant, and generally distributed.

* *J. SUPINUS*, Moench. (*J. bulbosus*, L.).—Common, and generally distributed. Var. *Kochii*, Syme.—Strome Ferry (Rev. E. F. Linton), 1885. Var. *fluitans*, Fries.—Loch a Mhuilinn, etc. Var. *uliginosus*, Roth.—Glen Docharty, Ullapool.

* *J. LAMPOCARPUS*, Ehrh.—Common. Var. *nigritellus*, Don.—Margins of Loch Maree.

* *J. SYLVATICUS*, Reich. (*J. articulatus*, L. pp.).—Not uncommon.

J. TRIGLUMIS, L.—Recorded by Churchill Babington in "Topographical Botany." It is much less frequent on the Ross mountains than on the Cairngorms or the Breadalbane mountains. I saw it on An Teallach, Sgurr Fhuaran, Meall Gorm, etc.

* *LUZULA VERNALIS*, DC.—Not frequent. Glen Docharty.

* *L. MAXIMA*, DC.—Widely distributed; plentiful on mountain cliffs and by waterfalls.

L. SPICATA, DC.—Without personal voucher in "Topographical Botany." On the Slioch, Ben Eay, Ben More, An Teallach, Meall Gorm it has been noticed by me.

* *L. CAMPESTRIS*, DC.—Common.

* *L. ERECTA*, Desf.—Common, and more frequently as the var. *congesta*, Koch. The var. *pallescent*, Koch., was noticed near Braemore.

* *SPARGANIUM ERECTUM*, L.—Rare. Dornie.

* *S. SIMPLEX*, Huds.—Loch Maree.

* *S. AFFINE*, Schnizl. (*S. natans*, Hooker et auct. var.).—In some small mountain lochs on Ben Eay; also at 2200 feet on the Slioch. Probably this was Dr. Lightfoot's *S. natans*, seen in lochs between Little Loch Broom and Ledbeg.

* *S. MINIMUM*, Fries. (*S. natans*, L. herb.).—In a small marshy place near Loch Alsh. I saw no *Sparganiums* in 1893 in Ross.

* *LEMNA MINOR*, L.—Rare. Kinlochewe. Not seen in 1893.

* *TRIGLOCHIN PALUSTRE*, L.—Glen Docharty, Ullapool, etc.

* *T. MARITIMUM*, L.—Common on the shores of Loch Carron, Little Loch Broom, etc.

* *POTAMOGETON NATANS*, L.—Recorded in the Applecross and Gairloch lists, but how far correctly I cannot say. It is much rarer than the next species, which the above record may have probably intended. The true *P. natans*, L., occurs in Loch a Mhuilinn.

* *P. POLYGONIFOLIUS*, Pourr.—Abundant both as the ericetal form and as the floating plant.

* *P. GRAMINEUS*, L. (*P. heterophyllus*, Schreb.).—In Loch a Mhuilinn. The unusual drought made the level of the water much lower, so that some of the plants were growing on the muddy margin of the loch as the form *terrestris* Meyer.

(*P. LUCENS*, L.—Gairloch, Dixon. Very doubtful; probably the foregoing species.)

* *RUPPIA ROSTELLATA*, Koch.—In brackish ditches at the head of Loch Carron. * Var. *nana*, Bosw.—Loch Carron, near Jeantown.

(? *ELEOCHARIS ACICULARIS*, Sm.—Kinlochewe. I should like to have this reaffirmed.)

* *E. PALUSTRIS*, R. Br.—Loch Clare. Recorded in the Applecross list. I saw it also in a loch on the moorland between Ullapool and Dundonnell, and in Strathcarron.

* *E. MULTICAULIS*, Sm.—Common, and widely distributed.

* *SCIRPUS PAUCIFLORUS*, Lightf.—Frequent.

* *S. FLUITANS*, L.—Loch Coulin, and in a small stream in Loch Carron.

* *S. CÆSPITOSUS*, L.—Abundant, and generally distributed.

* *S. SETACEUS*, L.—Kinlochewe 1887, Ullapool, Strathcarron, Applecross, etc., not rare.

S. LACUSTRIS, L.—Glencarron (Mr. Sewell). I have not seen this in the west watershed in Strathcarron; it is not rare in East Ross. It occurs in West Ross at Apple-

cross, in Loch a Mhuilinn and Loch Coulin, and by Loch Duich.

S. MARITIMUS, L.—Kintail ("Collectanea for a Flora of Moray," by Dr. Gordon, 1836, p. 3). I have seen it there as the var. *conglobatus*, Gray. It also occurs at Kishorn with the variety mentioned.

**S. RUFUS*, Wahlb.—Plentiful in two or three places on the shores of Loch Carron. The var. *bifolius* (*Blysmus rufus*, var. *bifolius*, Wallroth) also occurred, and appeared to gradually merge into the type.

**ERIOPHORUM VAGINATUM*, L.—Abundant, and generally distributed.

**E. POLYSTACHION*, L. (*E. angustifolium*, Roth.)—Abundant, and generally distributed. The var. *minus*, Koch, was seen on Slioch, etc. Var. *Vaillantianum*, Poit. et Turp.—Kinlochewe.

E. LATIFOLIUM, Hoppe.—"Topographical Botany," on faith of a specimen sent by Churchill Babington. I have not seen it in West Ross. There is an earlier record, Mr. Arth. Bennett points out, viz. Plockton, 6 miles w.s.w. of Strome Ferry (Mr. Stables). See "Gordon Coll.," p. 3, 1836.

RHYNOSPORA ALBA, Vahl.—Recorded by Churchill Babington in "Topographical Botany." It is locally common, as in Glen Torridon, Strathcarron, near Dundonnell, etc.

SCHÆNUS NIGRICANS, L. — "Topographical Botany (Churchill Babington)." Frequent. Especially abundant about Loch Broom side, Strathcarron, Applecross, etc.; also as the var. *nanus*, Lange, in Strathcarron.

CLADIUM JAMAICENSE, Crantz. (*C. germanicum*, Schrad.)—A. Evans 1890, see "Scotch Naturalist," 1891, p. 186. I have not seen it in the county.

**CAREX DIOICA*, L.—Not uncommon, and widely distributed; but much less frequent than *C. pulicaris*, L.

**C. PULICARIS*, L.—Abundant, and generally distributed.

**C. RUPESTRIS*, L.—A scrappy specimen gathered by me in 1880 near Glen Shiel may belong to this species. It occurs very sparingly on the Cnochan rocks in West Ross, and is not uncommon on the same rocks at a low altitude in West Sutherland.

**C. PAUCIFLORA*, Lightf.—Lower slopes of Ben Eay,

moorland in Glen Torridon, and moorland between the two Loch Brooms.

* *C. ARENARIA*, L.—Very local. I only saw it on a small piece of sandy coast near Polglass.

* *C. PANICULATA*, L.—Rare. In Gleann Bianasdail.

* *C. ECHINATA*, Murr.—Abundant.

* *C. REMOTA*, L.—Loch Coulin side, Dundonnell. Local and rare. The starved form *C. tenella*, Sm. (non Schk.), occurred by Loch Duich.

* *C. CANESCENS*, L.—Local and rare. Loch Alsh.

* *C. LEPORINA*, L.—Glen Shiel, Braemore, Dundonnell, Applecross, Kishorn, etc.

* *C. RIGIDA*, Good.—The Slioch, Ben Eay, An Teallach, Sgurr Fhuaran, etc. Common on the higher hills.

* *C. GOODENOWII*, J. Gay.—Common and variable. The var. *C. juncella*, Fries., occurred at Kinlochewe, and at Loch Achall, etc. The var. *melæna*, Wimm., at An Teallach and Ben Eay; it is simply a diseased state.

* *C. FLACCA*, Schreb. (*C. glauca*, Murr.).—Common and variable.

* *C. PILULIFERA*, L.—Common, and generally distributed. The var. *longibracteata* occurred on Ben Eay, An Teallach, and Cnochan.

* *C. PALLESCENS*, L.—Base of Sgurr Fhuaran, Braemore, Dundonnell, Applecross, Duncraig, Rhidorroch.

* *C. PANICEA*, L.—Common, and generally distributed.

* *C. VAGINATA*, Tausch.—Rare. The Slioch.

* *C. SYLVATICA*, Huds.—Strome, Braemore, Dundonnell, Applecross, Kishorn, etc.

* *C. BINERVIS*, Sm.—Abundant and variable. On the higher hills it occurs with much darker fruit and glumes—var. or f. *nigrescens*. On the moorlands as in Glen Torridon, Braemore, etc., it is sometimes four feet high, and has large, rather conical than cylindric spikelets. This form (*elatior*) is sometimes confused with *C. lævigata*.

C. LÆVIGATA, Sm.—On the authority of Mr. Grieve. I have not seen it in the county.

* *C. HORNSCHUCHIANA*, Hoppe.—Rather common.

* *C. FULVA*, Good.—Glen Torridon, Strathcarron. Var. *C. xanthocarpa*, Dègl.—Kinlochewe, Applecross, near Loch Clare 1888, Dundonnell 1894.

* *C. EXTENSA*, Good.—Near Jeantown by the shores of Loch Carron, and as the var. *pumila*, And.

* *C. FLAVA*, L.—Common. Var. *oederi*, Lilj.—Strathcarron, Applecross, etc.

* *C. CHRYSITES*, Link. (*C. oederi*, auct. var. non Ehrh).—Rare. At the upper end of Loch Carron.

C. FILIFORMIS, L.—Found by Mr. P. Ewing in 1887. So far I have not met with it.

* *C. ROSTRATA*, Stokes.—Common.

C. SAXATILIS, L.—Found by Mr. Sewell on Sgurr Ruadh at about 3000 feet.

* *PHALARIS ARUNDINACEA*, L.—Dornie, Applecross. Not common.

* *ANTHOXANTHUM ODORATUM*, L.—Common, and generally distributed.

* *ALOPECURUS GENICULATUS*, L.—Kinlochewe, Ullapool, Applecross, etc.

* *A. PRATENSIS*, L.—Dornie, Jeantown, Applecross, Ullapool, etc. Some very robust forms by Loch Carron in cultivated fields.

* *PHLEUM PRATENSE*, L.—Kinlochewe. Very robust form at Jeantown, Dundonnell.

* *AGROSTIS CANINA*, L.—Common. Abundant on the moorland in Glen Torridon as the f. *grandiflora*, Hack.; and on Ben Eay and the Slioch, from 1500 feet upwards to 3000 feet, as the var. *Scotica*, Hackel, which approaches *A. rubra*, Wahl. It occurs also as the sub-var. *mutica*. True *A. rubra* has flat radical leaves without runners. See Journ. Bot., 1890, p. 45–6.

* *A. ALBA*, L.—Abundant and variable. As the var. *coarctata*, Hoffm., at Kinlochewe, Strathcarron, Ullapool, Torridon, etc. Var. *maritima*, Meyer.—Jeantown, Polglass, etc. Var. *patula*, Gaud.—Ullapool.

* *A. VULGARIS*, With.—Common. Var. *pumila*, L.—Not uncommon. An Teallach, Meall Gorm, etc.

AIRA CARYOPHYLLEA, L.—Found by Mr. Ewing in 1887; it is not very common. I saw it in Strathcarron and Ullapool.

* *A. PRÆCOX*, L.—Ullapool, Keppoch, Braemore, Kinlochewe, etc.

* *DESCHAMPSIA CÆSPITOSA*, Beauv.—Abundant and

generally distributed. | Var. *alpina*, Gaud.—An Teallach, Meall Gorm. Var. *pallida*, Koch.—Applecross, Strathcarron, Kinlochewe.

* *D. FLEXUOSA*, Trin.—Common, and widely distributed. Var. *montana* (Huds.).—An Teallach, Meall Gorm, Ben Eay.

AVENA PUBESCENS, Huds. — “Topographical Botany” (Churchill Babington). On the limestone at Ullapool, and as the var. *glaberrima*, Borb., in Bænitz. Herb. Europ. = Var. *alpina*, Reichb., Fl. Excurs. 52, there and at Cnochan.

* *A. FATUA*, L.—Strome

* *HOLCUS MOLLIS*, L.—Strome, Ullapool, Jeantown.

* *H. LANATUS*, L.—Abundant and generally distributed. A common montane grass on Slioch.

* *ARRHENATHERUM AVENACEUM*, Beauv.—Attadale, Strome, Ullapool, etc. The var. *A. bulbosum* is the frequent plant at Ullapool, etc. I think it is a distinct sub-species.

* *SIEGLINGIA DECUMBENS*, Bernh.—Craigmore, Braemore, etc. Common.

* *PHRAGMITES COMMUNIS*, Trin.—Rather rare. Loch Duich, Glen Torridon, Polglass as the var. *uniflora*, Boreau.

SESLERIA CÆRULEA, Hard.—Recorded by Lightfoot in the “Flora Scotica” as *Cynosurus cæruleus*, growing on wet places on the sides of the mountains about Little Loch Broom. I did not see it on my short visit to An Teallach, but my exploration was stopped by heavy rain and mist, and I did not get as far as a small outcrop of the limestone where Lightfoot may have seen it. I failed to find it in 1894.

* *CYNOSURUS CRISTATUS*, L.—Kinlochewe, Ullapool, Donald, Jeantown, etc.

* *MOLINIA VARIA*, Schrank.—Abundant, probably the commonest grass in the county. Sometimes on the hills and dry rocks as the var. *depauperata*, Lindl.

MELICA NUTANS, L.—Strome (Rev. W. R. Linton). I saw it in the limestone gorge at Ullapool, by the waterfall at Jeantown, at Dundonnell, and Rhidorroch.

* *DACTYLIS GLOMERATA*, L.—Kinlochewe, Ullapool, Applecross, Jeantown, etc. Not abundant.

* *POA ANNUA*, L.—Common, and generally distributed. The var. *supina*, Schrad., on Slioch and An Teallach.

* *P. NEMORALIS*, L.—Rare. Near Strome. I did not see it anywhere in 1893 or 1894.

* *P. PRATENSIS*, L.—Common, and widely distributed. The var. *P. subcœrulea*, Sm., on the beach at Ullapool, at Strathcarron, and on limestone rocks at Cnochan.

* *P. TRIVIALIS*, L.—Common. A large, stout form which occurred at Ullapool is probably the var. *multiflora*, Reichb. The var. *glabra*, Doell.—Near Applecross and Ullapool.

* *G. FLUITANS*, Br.—Dornie, Ullapool, etc.

G. MARITIMA, Wahl.—Recorded by Lightfoot in “*Flora Scotica*” as *Poa maritima* from Loch Broom. It is abundant by Loch Carron, and also occurs about Kishorn, Ullapool, Applecross. It is a variable plant.

* *FESTUCA SCIUROIDES*, Roth. (*F. bromoides*, L.).—Strathcarron, Ullapool, Loch Torridon side.

* *F. OVINA*, L.—Abundant, and generally distributed from the sea-level to over 3000 feet. The var. *paludosa*, Gaud., is not uncommon. It occurred on a wall top with *Sieglingia*, *Pedicularis sylvatica*, *Carex pulicaris*, *Orchis maculata*, L. *Narthecium ossifragum*, *Carex echinata*, etc., at Braemore. *F. ovina* is frequently viviparous.

* *F. RUBRA*, L.—Not uncommon, and very variable. The f. *pruinosa*, Hackel, occurred by Loch Torridon, and is frequent as a plant of rocky coasts. Sub-var. *barbata*, Hack., on An Teallach. A depauperate form occurred by the Abtruinn Bruachaig near Kinlochewe, and a rigid glaucous form by Loch Maree, and a form with much larger spikelets near Duncraig.

* *F. SYLVATICA*, Vill.—I was pleased to find this handsome species by the waterfall at Jeantown, and in a shady gorge at Dundonnell.

* *F. ELATIOR*, L.—Rare. On the limestone at Kishorn.

* *F. ARUNDINACEA*, Schreb.—A plant probably belonging to this species was gathered in a field close to Courthill House at Kishorn.

* *BROMUS GIGANTEUS*, L.—Rather rare. Strome, Inverlael, Jeantown, Rhidorroch, Dundonnell.

* *B. RAMOSUS*, Huds.—Rare. Inverlael.

* *B. SECALINUS*, L.—A rather rare colonist at Strathcarron, Ullapool, and Dundonnell.

* *B. RACEMOSUS*, L.—Ullapool.

* *B. MOLLIS*, L.—Not uncommon. The var. *glabrescens*, Coss., at Ullapool.

* *B. COMMUTATUS*, Schrad.—Ullapool.

* *BRACHYPODIUM GRACILE*, Beauv.—Local. Applecross, Rhidorroch, and by the waterfall near Jeantown.

* *LOLIUM PERENNE*, L.—Dornie, Kinlochewe, Ullapool, Strathcarron, etc.

: *L. ITALICUM*, Braun.—Kinlochewe. Planted.

* *AGROPYRON CANINUM*, Beauv.—By the waterfall at Jeantown, Dundonnell, Rhidorroch.

* *A. REPENS*, Beauv.—Common, and very variable. As the var. *Leersianum*, Gray, at Ullapool, etc.; as the var. *barbatum* (Duval-Jouve), at Strathcarron; and as a stiff maritime form, var. *maritimum*, Mihi., by the coast at Jeantown. The glaucous form, var. *cæsius*, Döll, also occurred in Strathcarron.

* *A. JUNCEUM*, Beauv.—On the small bit of sea sand at Polglass.

* *NARDUS STRICTA*, L.—Rather common, and widely distributed.

* *ELYMUS ARENARIUS*, L.—On the finer shingle of Loch Broom between Ullapool and Inverlael, and at Polglass on the sand.

HYMENOPHYLLUM UNILATERALE, Bory. — Recorded as *Trichomanes tunbridgenses*, near Loch Mari, by Dr. Lightfoot. In "Topographical Botany," but without personal authority. I saw it by the rail side near Strome Ferry. It is also given in Dixon's list.

* *PTERIS AQUILINA*, L.—Common, and widely distributed.

* *CRYPTOGRAMME CRISPA*, Br.—Local. Sgurr Fhuaran, Meall Gorm, and Sgurr na Caorach. In the Beallach Pass it is abundant.

* *LOMARIA SPICANT*, Desv.—Common, and widely distributed.

* *ASPLENium ADIANTUM-NIGRUM*.—Common, and widely distributed.

A. MARINUM, L.—Given in both the Applecross and Gairloch lists. It occurs in a sea cave near Applecross.

A. VIRIDE, Huds.—Recorded from the Cnochan rocks by Lightfoot in the "Flora Scotica." It is local. I saw it

in the limestone gorge near Ullapool, and by the waterfall near Jeantown. It is abundant on the Cnochan rocks.

* *A. TRICHOMANES*, L.—Common, and widely distributed, especially near the sea.

* *A. RUTA-MURARIA*, L.—Common. The var. *pseudo-germanicum*, Milde., occurred in the limestone gorge near Ullapool, and at Cnochan.

A. SEPTENTRIONALE, L.—Given by Mr. Dixon in the list of Gairloch plants.

* *ATHYRIUM FILIX-FEMINA*, Roth.—Common, and as the vars. *convexum*, and *molle*, by Loch Maree, etc.

SCOLOPENDRIUM VULGARE, Symons.—Rare. Recorded in the Applecross list. It occurs near Kishorn, but very rarely.

* *CYSTOPTERIS FRAGILIS*, Bernh.—Not uncommon, and as the var. *dentata*, Hook.

POLYSTICHUM LONCHITIS, Roth.—Given in the "Flora Scotica" as occurring on the limestone rocks at Cnochan. I found a small specimen on Ben Eay, and it is given in Dixon's list. It is common and luxuriant on the Cnochan rocks.

* *P. LOBATUM*, Presl.—Rather rare on both sides of Strathcarron, and as the var. *aculeatum*, Syme.

* *LASTREA OREOPTERIS*, Presl.—Common and widely distributed.

* *L. FILIX-MAS*, Presl.—Generally distributed. The var. *paleacea*, Moore., at Lieuthgoch, Kinlochewe, etc.; the var. *affinis*, Bab., at Ullapool; and the var. *pumila*, Moore, on An Teallach.

* *L. SPINULOSA*, Presl.—Glen Shiel, Applecross, Kinlochewe, etc.

* *L. DILATATA*, Presl.—Common and variable.

* *L. ÆMULA*, Brack.—Glen Docharty.

* *POLYPODIUM VULGARE*, L.—Common, and also as the form var. *breves*, Lange.

* *PHEGopteris DRYopteris*, Fée.—Not common. Loch Clare side, near Ullapool, Jeantown, Cnochan not typical.

* *P. POLYPODIOIDES*, Fée.—Not very common, Strome, Braemore, Ullapool, Cnochan, etc.

* *OSMUNDA REGALIS*, L.—Duncraig, near Jeantown, Dundonnell, and near Applecross. In one of the islands in Loch Maree.

(OPHIOGLOSSUM VULGATUM, L.—Given in Dixon's list.

BOTRYCHIUM LUNARIA, L.—Recorded by Lightfoot "from Dundonald," near Ullapool, and at the south end of Loch Duich.

EQUISETUM MAXIMUM, Lamk.—Local. Given in the Applecross list. I saw it close to the window of the little inn at Applecross, and it is plentiful in the woods close by.

* E. ARVENSE, L.—Not very common. Kinlochewe, Jeantown, etc. Also as a curious form or variety at Applecross.

* E. SYLVATICUM, L.—Widely distributed, but not extremely common. The var. *capillare*, Hoffm., at Kinlochewe.

* E. PALUSTRE, L.—Not very common. Loch Clare, Ullapool, Jeantown.

* E. LIMOSUM, L.—Loch Coulin, Kishorn, Strathcarron, Drumroonie, etc.

* Lycopodium SELAGO, L.—Not very common. On the Slioch as the var. *recurvum*, Desv., also as the type on Ben Eay. The var. *appressum*, Desv., on a mountain in Strathcarron, on An Teallach.

L. INUNDATUM, L.—See "Topographical Botany." I have a recollection of seeing it recorded from Kinlochewe.

L. ANNOTINUM, L.—West Ross (Stables). Sparingly on An Teallach.

* L. CLAVATUM, L.—Carnasoug, Ben Eay, etc., but not common. I did not see it in 1893.

* L. ALPINUM, L.—Rather common on the higher hills. The var. *decipiens* (*L. complanatum*, L., var. *anceps*, Baenitz, Herb. Europ.).—Rare. Ben Slioch, An Teallach, Ben Eay, etc. In 1893 I saw but few specimens of the *Lycopods* in Ross; in 1894 they were more common.

* SELAGINELLA SELAGINOIDES, Gray.—Not unfrequent, as Glen Shiel, Torridon, Strathcarron, Beallach na bo Pass, An Teallach, and Cnochan.

* ISOETES LACUSTRIS, L.—Common in Loch Maree. It is found at about 2000 feet on top of the Beallach na bo Pass as the var. *falcata*, Tausch.

I. ECHINOSPORA, Dur.—Recorded by Mr. Ewing.

CHARA FRAGILIS, Desv.—Recorded by Mr. C. Bailey. It is plentiful in Loch a Mhuilinn and Loch Achall, and as the

var. *delicatula*, Br., in a small stream in Strathcarron, and at Applecross.

* *NITELLA OPACA*, Agardh.—Loch Maree. Apparently rare.

A few critical plants are still being investigated.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING JANUARY 1894. By ROBERT LINDSAY, Curator.

During the past month of January the thermometer fell below the freezing point on nineteen occasions, indicating collectively 121° of frost for the month, as against 100° for the corresponding month last year. The lowest reading was 9° , or 23° of frost, which was registered on the 7th of the month. (The same amount was registered on the 6th of January last year, and was the lowest reading recorded last winter.) Other very low readings were registered on the mornings of the 6th and 8th, when the glass fell to 13° and 15° respectively. The lowest day temperature was 22° on the 6th, and the highest 58° on the 14th. Of the forty selected plants whose dates of flowering are annually recorded to the Society, the following came into flower, viz.:—*Bulbocodium vernum*, on 12th January; *Galanthus nivalis*, 16th; *Leucojum vernum*, 18th; *Eranthis hyemalis*, 19th; *Daphne Mezereum*, 19th; *Scilla præcox*, 22nd; *S. siberica*, 22nd; *Galanthus plicatus*, 22nd; *Rhododendron atrovirens*, 24th.

On the rock-garden 22 plants came into flower during the month, as against 13 last January. Amongst which were the following, viz.:—*Arabis procurrens*, *Helleborus viridis*, *Hepatica triloba*, *H. angulosa*, *Hyacinthus azureus*, *Galanthus Elwesii*, *G. Imperati*, *Iris sophonensis*, *Primula elatior*, *Synthiris reniformis*, *Triteleia uniflora*, etc. Several plants of *Yucca gloriosa* are developing flower-spikes at a very unusual period of the year.

Readings of exposed Thermometers at the Rock-Garden of the
Royal Botanic Garden, Edinburgh, during January 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	26°	35°	39°	17th	38°	40°	48°
2nd	28	33	39	18th	36	38	47
3rd	27	30	36	19th	35	40	49
4th	29	32	36	20th	36	41	47
5th	28	31	36	21st	38	45	52
6th	13	14	22	22nd	31	35	41
7th	9	13	31	23rd	25	27	37
8th	15	21	33	24th	28	41	50
9th	25	35	44	25th	36	38	45
10th	31	32	50	26th	29	30	49
11th	41	47	50	27th	34	47	51
12th	37	44	50	28th	27	32	39
13th	38	45	52	29th	28	32	44
14th	39	43	58	30th	31	33	39
15th	30	33	43	31st	27	30	40
16th	35	47	57				

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF JANUARY 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direction.	
		Max.	Min.	Dry.	Wet.					
1	30.408	47.8	31.0	36.2	33.0	N.	Cum.	9	N.	0.000
2	30.350	37.0	30.7	35.1	34.2	N.E.	Cum.	8	N.E.	0.010
3	30.683	38.1	30.1	32.6	30.0	S.E.	Cum.	10	S.E.	0.000
4	30.511	36.0	32.1	35.2	31.2	E.	Cum.	10	E.	0.015
5	30.006	35.8	30.0	33.1	30.0	E.	Cum.	10	E.	0.040
6	29.563	35.8	15.5	16.2	14.9	N.	Cir.	1	S.	0.000
7	29.692	20.8	11.8	14.1	12.9	Calm.	Fog	5	...	0.000
8	29.918	25.2	13.2	21.5	21.1	E.	Fog	5	...	0.010
9	29.581	37.2	21.7	37.2	35.6	E.	Cum.	10	S.	0.010
10	29.358	44.8	35.0	44.8	43.0	S.W.	{ Cir. St. Cum.	{ 7 1	{ S. S.W. }	{ 0.020 0.020
11	29.360	51.9	44.0	49.8	48.2	S.	Nim.	10	S.	0.045
12	29.515	52.8	40.4	47.1	44.1	S.	Cir.	5	S.	0.005
13	29.556	49.8	41.4	48.2	44.2	S.	...	0	...	0.000
14	29.647	50.9	39.7	43.0	42.0	S.	Cum.	10	S.	0.000
15	29.771	45.2	31.2	32.3	32.2	W.	Cum.	5	W.	0.215
16	29.375	47.1	32.6	46.5	44.0	S.	Cir.	4	W.	0.085
17	29.151	51.6	41.6	42.0	40.6	S.W.	Cum.	3	S.W.	0.030
18	29.177	46.7	37.7	39.8	38.9	N.W.	...	0	...	0.005
19	29.540	45.7	36.8	41.2	39.5	S.W.	Cir. St.	10	S.W.	0.115
20	28.898	48.6	41.0	42.8	40.9	S.W.	{ Cir. Cum.	{ 1 6	{ W. S.W. }	{ 0.020 0.020
21	29.389	45.7	41.0	45.1	43.1	W.	{ Cir. Cum.	{ 4 3	{ W. W. }	{ 0.315 0.000
22	29.174	46.8	36.0	36.0	34.9	W.	...	0	...	0.000
23	29.707	41.5	28.2	29.2	27.9	W.	...	0	...	0.000
24	29.576	42.0	29.0	42.0	40.0	S.W.	Cir. St.	10	W.	0.080
25	29.467	48.9	39.0	39.8	38.1	S.W.	Cir.	1	W.	0.175
26	29.342	43.9	30.8	32.2	31.0	W.	Nim.	10	W.	0.145
27	28.947	49.0	31.9	49.0	47.2	S.W.	Nim.	10	S.W.	0.360
28	28.953	49.8	32.7	34.2	33.0	W.	Cir. St.	10	W.	0.150
29	29.754	36.1	30.1	33.1	32.0	S.W.	...	0	...	0.200
30	29.085	43.6	33.0	37.1	35.1	S.W.	Nim.	10	S.W.	0.235
31	29.087	37.1	31.1	31.9	30.6	W.	...	0	...	0.045

Barometer.—Highest Observed, on the 3rd, = 30·683 inches. Lowest Observed, on the 20th, = 28·898 inches. Difference, or Monthly Range, = 1·785 inch. Mean = 29·566 inches.

S. R. Thermometers.—Highest Observed, on the 12th, = 52°·8. Lowest Observed, on the 7th, = 11°·8. Difference, or Monthly Range, = 41°·0. Mean of all the Highest = 43°·0. Mean of all the lowest = 32°·3. Difference, or Mean Daily Range, = 10°·7. Mean Temperature of Month = 37°·6.

Hygrometer.—Mean of Dry Bulb = 37°·0. Mean of Wet Bulb = 35°·3.

Rainfall.—Number of Days on which Rain fell = 23. Amount of Fall = 2·330 inches. Greatest Fall in 24 hours, on the 27th, = 0·360 inch.

A. D. RICHARDSON,
Observer.

III. ON PLANTS IN PLANT HOUSES, WITH EXHIBITION OF SPECIMENS. By R. L. HARROW.

During the month of January about forty species of plants have produced their flowers in the houses of the Royal Botanic Garden, the majority being inmates of tropical houses. The effect of brighter and longer days is already apparent in these houses by the plants starting into new growth, the new foliage generally presenting a pleasing appearance. This is especially noticeable in the Palm House amongst Cycads, Palms, and ornamental foliage plants. Amongst the most worthy of flowering plants may be noted:—

Clerodendron splendens, G. Don. This is an evergreen species with oblong shining leaves, produced upon a slender climbing stem. Flowers are scarlet, with yellowish green stamens and pistil, and are borne in terminal corymbose panicles sometimes more than six inches across, and thus forming a gorgeous winter-flowering stove climber. It is a native of Sierra Leone, and, although introduced in 1839, is still rarely seen in cultivation in this country.

Vanda Amesiana, Rehb. This is a comparatively recent introduction, first imported by Messrs. Low & Co., of Clapton, from the southern Shan States of Burmah, where it is said to grow at an elevation of from four to five thousand feet. The plant is of a small erect habit, leaves fleshy, rounded, with a grooved upper surface. The racemes of flowers are very fragrant, the sepals and petals being tinged with a slight purple shade, yet this colouring seems to be variable in the species, some plants producing almost pure white flowers which last a considerable time in perfection.

Medinilla javanensis, Blume. A tropical evergreen shrub growing to about four feet in height, with four-angled stems, elliptic sessile leaves, with very prominent venation. It is a floriferous species with terminal panicles, bearing numerous pink white flowers of a waxy appearance, the anthers being dark purple. Messrs. Rollison were the first to introduce this species, at whose nursery it first flowered in 1850, from which a figure was prepared for the "Botanical Magazine," 4569.

Specimens of these and of the following are exhibited :—
Anoiganthus breviflorus, Baker,—a pretty, spring flowering, bulbous plant from Natal. *Edgworthia Gardnerii*, Meissn., —a shrubby, deciduous plant belonging to the order Thymelacaceæ, with terminal inflorescences of yellow flowers, inhabiting the regions of the Himalayas and China, often called *E. chrysantha*, Lindl. Others most worthy of note are *Cabomba aquatica*, Aubl.,—a long growing aquatic with finely divided leaves, a native of Mexico; *Lachenalia tricolor*, Linn., and *L. Nelsoni*, Hort.; *Cypripedium villosum*, Lindl., and *C. Hookeræ*, Rehb. fil.,—a Bornean species; *Caraguata Zahnii*, Hook.,—a bromeliad from Central America; *Thunbergia laurifolia*, Lindl.

MEETING OF THE SOCIETY,

Thursday, March 8, 1894.

Professor BOWER, President, in the Chair.

Sir A. BUCHAN HEPBURN, Bart., and Mr. A. THOMSON, were elected Resident Fellows of the Society.

The PRESIDENT informed the Society of the death of ROBERT HUTCHISON and of ALEXANDER GALLETLY, Fellows of the Society, and of JOSEPH WHITTAKER, Associate.

Cut flowers of *Hepatica triloba*, *Scilla siberica*, *Narcissus pseudo-narcissus* and *N. Bulbocodium*, *Berberis Darwinii*, *Ribes sanguineum*, and *Daphne Mezereum* were exhibited from the open garden of Mr. CAMPBELL, at Ledaig, Argyllshire.

Mr. RUTHERFORD HILL exhibited specimens of the flowers from which Dalmatian insect powder is prepared. These were the flower-heads of the *Pyrethrum cinerariæ-folium*, Treviranus, a native of Dalmatia and Montenegro. The flowers imported from Dalmatia were cultivated chiefly at Citta Vecchia and Ragusa, and were also collected from wild plants growing on the hills in Montenegro. The wild flowers were reputed to yield the most powerful insecticide. The plant was now cultivated in Australia, South Africa, California, and near Berlin. It was a comparatively hardy plant, growing at an elevation of from 6000 to 7000 feet. The original insect powder came from Persia, being yielded by two allied species, the *Pyrethrum roseum* and *P. carneum*, Bieberstein. All authorities agreed that the Dalmatian powder was a superior insecticide to the Persian, and this comparative weakness of the latter had been attributed to the fact that the flowers of the Persian

species were more prone to become "double" than those of the Dalmatian. When an insect was exposed to the action of the powder it was speedily paralysed, but in a few minutes seemed to slightly revive again. Soft-bodied insects, such as house flies and bees, were speedily killed, but hard-bodied insects, like beetles and cockroaches, resisted its action for a much longer time, and were not killed till after 50 or 60 hours exposure. Though not dead they were, however, rendered helpless, and could be easily captured and destroyed. The insecticidal properties of the flowers had been attributed to various constituents, and their toxic action was not thoroughly understood. They contained a small percentage of a volatile oil, which gave them their characteristic "tea-like" odour and slightly aromatic taste. It had been stated that the volatile oil was the active constituent, but that had not been proved. Schlagdenhauffen and Reeb found in the flower-heads a poisonous volatile acid, *chrysanthemic acid*, and also a poisonous non-volatile acid, *pyrethrotoxic acid*, to both of which they ascribed the insecticidal properties of the powder.

The specimens shown consisted of the three grades met with in commerce, namely:—

1. The *closed* flower-heads. These were the best quality, and by grinding these the finest and most powerful insect powder was obtained. They were worth, in the wholesale market, about £5, 16s. per cwt.
2. The *half-closed* flower-heads. From these a second grade of insect powder was obtained. They were less aromatic and less powerfully insecticidal than the preceding grade. They were worth about £4 per cwt.
3. The *open* flower-heads. These were the lowest commercial grade, and worth only about £3 per cwt.

Professor BAYLEY BALFOUR directed the attention of the Society to a paper in the "Kew Bulletin," giving an account of the production of citric acid, on a commercial scale, from sugar, by the agency of a form of *Penicillium*.

The following Papers were read:—

The PRESIDENT gave an interesting display of lantern-slides illustrating his views, which he explained, of the progressive sterilisation of cells in sporangia of the *Pteridophyta*.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING FEBRUARY 1894. By ROBERT LINDSAY, Curator.

The past month of February has been remarkable for the excessive rainfall that took place, which was unprecedented for February, and for the stormy, unsettled weather that prevailed throughout the whole month. Gales from the westward or south-westward were frequent. The thermometer was at or below the freezing point on fifteen occasions, indicating collectively for the month 63° of frost, as against 64° for the corresponding month last year. The lowest readings occurred on the 1st, 24°; 14th, 20°; 15th, 22°; 19th, 25°; 22nd, 25°. The lowest day temperature was 36°, on the 17th, and the highest 55°, on the 6th. Vegetation generally is well forward. A large number of spring plants are in blossom. Ribes, thorns, roses, lilacs, and other hardy shrubs are fast starting into growth. Deciduous trees, such as elm, poplar, alder, and hazel are bearing large quantities of flower buds. Very little injury has been done by frost this winter so far as it has gone. Of the forty spring-flowering plants whose dates of flowering are annually recorded, the following 11 came into flower, viz.:—*Coryllus Avellana*, on 3rd February; *Rhododendron Nobleanum*, 3rd; *Scilla bifolia*, 5th; *Crocus Susianus*, 6th; *C. vernus*, 12th; *Symplocarpus foetidus*, 13th; *Nordmannica cordifolia*, 14th; *Iris reticulata*, 19th; *Tussilago nivea*, 19th; *Arabis albida*, 20th; *Mandragora officinalis*, 26th.

On the rock-garden 40 species and varieties came into flower during the month, the same number as for the corresponding month last year. Among the more interesting were—*Colchicum crociflorum*, *Corydalis angustifolius*,

Chionodoxa sardensis, *Galanthus Redoutei*, *Daphne Blagayana*, *Leucojum carpaticum*, *Narcissus minimus*, *Helleborus antiquorum*, *H. abschasicus*, *H. orientalis*, *Rhododendron lapponicum*, *R. præcox*, *Saxifraga Burseriana*, *S. oppositifolia*, etc.

Readings of exposed Thermometers at the Rock-Garden of the
Royal Botanic Garden, Edinburgh, during February 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	24°	30°	50°	15th	22°	33°	41°
2nd	38	47	53	16th	34	37	43
3rd	36	40	41	17th	34	35	36
4th	35	43	51	18th	31	34	43
5th	33	37	52	19th	25	31	41
6th	36	48	55	20th	32	38	43
7th	35	43	49	21st	36	39	47
8th	36	40	48	22nd	25	35	36
9th	39	40	43	23rd	31	43	49
10th	28	36	43	24th	30	35	39
11th	31	35	49	25th	30	42	50
12th	35	36	42	26th	32	42	51
13th	26	33	41	27th	36	43	49
14th	20	27	41	28th	30	35	46

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF FEBRUARY 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direction.	
		Max.	Min.	Dry.	Wet.					
1	29·518	37·1	27·1	31·2	30·6	W.	Cir.	5	N.W.	0·115
2	29·499	48·9	31·7	48·0	46·9	W.	Cum.	10	W.	0·160
3	29·602	52·7	40·2	41·6	39·0	W.	...	0	...	0·060
4	29·998	46·0	37·4	46·0	44·8	W.	Nim.	10	W.	0·010
5	30·199	52·4	34·7	36·9	35·9	S.W.	Cir.	10	...	0·045
6	29·458	49·8	36·8	49·8	46·9	S.W.	Nim.	10	S.W.	0·385
7	29·267	53·8	45·2	45·2	44·9	W.	Nim.	10	W.	0·520
8	29·760	46·8	37·0	41·5	39·2	W.	...	0	...	0·100
9	29·384	46·7	40·8	42·1	40·9	W.	Cir. St.	10	W.	0·490
10	29·144	46·7	34·2	35·8	35·0	N.W.	Cir.	3	N.W.	0·145
11	29·026	38·7	35·1	36·1	35·9	E.	Nim.	10	E.	1·020
12	28·968	49·3	35·3	37·8	35·7	N.W.	Cir.	5	N.W.	0·000
13	29·790	42·4	29·8	32·0	30·6	W.	...	0	...	0·010
14	30·076	39·1	23·9	26·4	24·4	W.	...	0	...	0·000
15	29·999	39·2	26·6	34·6	31·9	E.	Nim.	10	E.	0·165
16	29·880	40·8	33·0	40·1	40·0	E.	Nim.	10	E.	1·650
17	29·960	42·8	36·0	36·1	35·8	S.E.	Nim.	10	S.E.	0·285
18	30·330	36·7	32·1	35·0	32·9	S.E.	Cir.	2	N.W.	0·000
19	30·350	39·0	28·7	31·9	29·2	W.	Cir.	9	N.W.	0·000
20	30·332	39·0	31·2	39·0	37·8	W.	{Cir. St. Cum.	{5 5}	W.	0·000
21	30·144	43·4	38·3	40·2	39·1	S.W.	Cir.	9	N.W.	0·000
22	30·239	45·6	30·0	32·2	31·1	W.	Fog	2	...	0·010
23	29·618	48·0	32·8	43·0	40·1	S.W.	Cir.	5	S.W.	0·482
24	29·279	47·8	32·3	33·2	32·8	W.	...	0	...	0·140
25	29·108	41·8	32·8	41·8	40·1	S.	Nim.	10	W.	0·370
26	29·195	48·9	36·0	43·5	42·2	W.	Nim.	10	S.W.	0·150
27	29·384	50·7	40·0	40·5	36·9	W.	...	0	...	0·085
28	29·539	46·5	34·3	40·0	38·1	N.W.	Cir.	6	S.W.	0·300

Barometer.—Highest Observed, on the 19th, = 30·350 inches. Lowest Observed, on the 12th, = 28·968 inches. Difference, or Monthly Range, = 1·382 inch. Mean = 29·680 inches.

S. R. Thermometers. — Highest Observed, on the 7th, = 53°·8. Lowest Observed, on the 14th, = 23°·9. Difference, or Monthly Range, = 29°·9. Mean of all the Highest = 45°·0. Mean of all the Lowest = 34°·0. Difference, or Mean Daily Range, = 11°·0. Mean Temperature of Month = 39°·5.

Hygrometer.—Mean of Dry Bulb = 38°·6. Mean of Wet Bulb = 37°·1.

Rainfall.—Number of Days on which Rain fell = 22. Amount of Fall = 6·697 inches. Greatest Fall in 24 hours, on the 16th, = 1·650 inch.

A. D. RICHARDSON,
Observer.

III. ON PLANTS IN THE PLANT HOUSES, WITH EXHIBITION OF SPECIMENS. By R. L. HARROW.

About sixty species of plants have flowered in the houses of the Royal Botanic Garden during February, this number being a decided increase upon that of the preceding month. The earlier flowering *Acacias* have done much, with their numerous heads of usually bright yellow flowers, to give the several houses containing them a bright appearance. Conspicuous amongst them being the well-known *A. dealbata*, Link., so commonly seen in the windows of florists; the greater quantity of the supply for our markets coming from the Riviera, where it is very successfully cultivated out of doors. M. Vilmorin, in a paper read before the Royal Horticultural Society, mentions an artificial process to facilitate the opening of the flowers of this species in that district:—"The flowering branches are cut a week or so before they would bloom in the open, and are submitted, with their butt end steeped in water, to the action of moderately heated steam. The flowers expand in from ten to twenty hours, and last as long afterwards as if cut direct from the tree."

Amongst the others exhibited are *A. discolor*, Willd., a stiff-growing plant with long spikes of flowers lasting for a considerable period, native of New South Wales, and introduced in 1788.

A. melanoxylon, R. Br. From Australia, with large balls of light yellow flowers, the plant being bush-like in habit, bearing rather large leathery phyllodes; the native name being Blackwood.

A. longifolia, Willd. The spikes are thickly crowded with small flowers, the phyllodia being linear lanceolate. It is of an erect habit of growth.

A. Latrobei, Meissn. This is an extremely graceful, free-flowering plant, with small phyllodes; the flower-heads solitary, and produced a good distance from the apex of the shoot.

A. imbricata, F. Mueller. Very similar as regards its flowering, but differing in its more loose mode of branching, and the phyllodes being rather larger.

A. verticillata, Willd. This is a distinct species, with

linear phyllodes, and solitary axillary spikes. Introduced in 1780.

The Camellias have also been very showy, the colours ranging from dark red to pure white, about twelve varieties of which we are able to exhibit.

Deherainia smaragdina, Decne. Is one of the small number of plants which bear green flowers. The plant under notice is a member of the order Myrsinaceæ, being a native of Mexico. In habit it is a small, compact-growing shrub with dense foliage, the oblong lanceolate leaves covered with brown hairs. The flowers are borne in clusters towards the apex of the growths, being scarcely discernable amongst the green foliage where they are concealed. The flowers are about two inches in diameter. Formerly known under the name of *Theophrasta smaragdina* it was first introduced in 1876, and this is probably the first time of flowering in this garden, the plant exhibited having been received from Kew during 1893.

Lælia harpophylla, Rchb. fil. A slender-growing plant, till recently rare in cultivation, the flowers having an unusual colour amongst orchids. In Messrs. Veitch's "Manual of Orchidaceous Plants" it is said to have first flowered in 1867, and that, although introduced from Brazil, no record was obtainable as to the locality.

Amongst the others worthy of note are: *Tillandsia splendens*, Brongn.,—a native of British Guiana, with bright purple bracts; *Phyllocladus rhomboidalis*, Rich.,—a coniferous tree, growing to a height of sixty feet in New Zealand; *Illicium floridanum*, a brightly coloured magnoliaceous plant, introduced from Florida in 1771; *Pilocarpus pennatifolius*, Lem.,—a Brazilian plant furnishing the jaborandi of commerce; *Brunsfelsia latifolia*, Benth.; *Cælogyne testacea*, Lind.; *Dendrobium primulinum*, Linn.; and *Phalænopsis Schilleriana*, Rchb. fil.

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MEETING OF THE SOCIETY,

Thursday, April 12, 1894.

Dr. WILLIAM CRAIG, Vice-President, in the Chair.

The presentation to the Society of a copy of Goode-nough's *Algae*, by Mr. G. W. TRAILL, was announced.

Miss MADDEN exhibited a twig in flower of *Stauntonia latifolia* from a plant grown at Royal Terrace, Edinburgh.

Surgeon-Major H. H. JOHNSTON exhibited specimens of cultures of Bacteria from water, and pointed out the inadequacy of most filters to prevent the passage of Bacteria.

Mr. CAMPBELL sent from his open garden at Ledaig, blooms of *Acacia linearifolia*, *Orchis mascula*, *Erica mediterranea*, and *Pyrus communis*.

The following Papers were read :—

91947

THE INFLUENCE OF LIGHT ON THE RESPIRATION OF GERMINATING BARLEY AND WHEAT. By T. CUTHBERT DAY.

INTRODUCTION.

Though this paper was written as long ago as 1886, still, as far as I am aware, the work is new. I have not come across any communication on the subject since, and the paper I have the honour of bringing before your notice to-night has not been read before any society as yet. The fact is I hardly knew what to do with it. I did not think it suitable for the Chemical Society, as not being nearly chemical enough, though there is a fair amount of chemical work in it. As the paper is fairly in the domain of vege-

Issued November 1894.

table physiology, I thought it might interest the members of this Society, and I trust you may find at least some matter worthy of your attention in it.

From a practical point of view the importance of the subject is really almost nil, but in almost every book on malting the influence of light on germination is mentioned, and in regard to it some fearful and wonderful statements are sometimes put forward. Some maltsters, as I have seen in various places, have adopted blue glass for the windows of the malting floors, under the impression that by admitting the actinic rays of light they favour in some way the germination of the grain, apparently losing sight of the fact that their operations are practically carried on in the dark, as far as germination is concerned, seeing that it is only the upper layer of corns that is exposed to the light. Some other maltsters, prefer having their floors altogether dark, which is often an advantage, because direct sunlight is excluded, and the consequent undue elevation of temperature is avoided, which, of course, would affect the germinative activity to a considerable extent.

Many experiments have been recorded at different times by various authors in connection with the influence of light on the germination of seeds, but the results arrived at have been very conflicting.

The state of uncertainty in which this question still remains has induced me to make a series of experiments, using every means which I could devise to avoid the interference of outside influences, in order to arrive, if possible, at a definite solution of the problem as to whether light retards or accelerates the respiratory functions of such seeds as barley and wheat during the process of germination. My chief purpose in making this communication is rather to place on record the methods employed and their result, than to put forward any particular conclusions that might be deduced from the experiments.

Among the experimenters who have worked on this subject, the following names may be mentioned. They are collected from the historical record of the subject, with references, given by M. A. Pauchon in his memoir, to be alluded to again :—

Miesse (*Expériences sur l'Influence de la Lumière sur les Plantes*.—*Journal de Physique de Rozier*, T. 6, Dec. 1775) considered that light has little or no influence on germination.

Sénebier (*Memoires Physico-Chimiques*, 1782) concluded that light was hurtful to the germination of seeds.

Ingenhousz held the same opinion as Sénebier as to the action of light (*Expériences sur la Végétation*, 1787-89).

The Abbe Bertholon (*Journal de Physique de Rozier*, Dec. 1789) criticises previous experiments on the subject, laying special stress on the necessity of equality in the degree of humidity of the seeds experimented upon.

Sénebier (*Physiologie Végétale*, 1800) in subsequent experiments, called forth by the remarks of the Abbe Bertholon, and taking care to adopt the precautions suggested by the latter, is led to the same conclusion as formerly.

E. Lefébure performed many experiments on the action of light, especially with regard to the action of coloured rays. In the latter inquiry he does not arrive at any definite result. He discovers a retardation of germination under the influence of white light. The experiments were made without regard to small differences of temperature, though considerable trouble was taken to secure similarity in the conditions of moisture (*Expériences sur la Germination des Plantes*, 1800).

Th. de Saussure (*Recherches Chimiques sur la Végétation*, 1804) regarded the action of direct sunlight as hurtful to the seeds on account of the heat which accompanies it, but in diffused light, when every precaution was taken to ensure similarity in the conditions of temperature and moisture, he does not perceive any difference in the progress of germination.

A. P. de Candolle (*Phys. Végét.*, 1832) thinks that light has no action on the germinative activity.

Ch. Morren (*An. Sc. Nat.*, 1832) considers that obscurity favours the first period of germination.

Mayen (*Neues System der Pflanzen-physiologie*, 1837) made experiments with seeds of six different genera of plants, observing equal conditions of heat and moisture

He noticed that the appearance of the radicle and the development of the cotyledons were the same in light as in darkness.

G. Ville (Revue de Cours Scientif., 1865) considers that the action of light is inconsiderable.

M. Faivre (1879), experimenting with seeds of *Tragopogon porrifolius*, noticed that the seeds developed chlorophyll and sap more rapidly under the influence of yellow light than under the influence of blue light.

It will be readily seen, from a perusal of the foregoing resumé, that there is no real concordance in the results obtained by the different experimenters.

There are two serious defects in the methods of experiment followed. The first is a failure to secure *real* identity in the conditions under which the seeds were germinated in light and darkness. Similarity in temperature and moisture is of the most paramount importance; and though at first sight it might appear easy to secure identity in this respect, it is in reality a matter of considerable difficulty. The material used as a shield from the light to one of the vessels containing the seeds operated upon, must make a difference in the amount of heat absorbed or radiated, especially if the vessels are surrounded by air, or if they are situated far apart. If similarity of moisture is secured, in the first place, by steeping the seeds for the same length of time in water at the same temperature, this similarity is destroyed during the experiment if the surface of one of the containing vessels becomes colder than the other; because, in that case, though moisture is condensed on the inner surface of both vessels, the coldest vessel will have the greatest amount of condensation, and the moisture so condensed is derived from the seeds, unless special provision is made to keep the contained air saturated with moisture. The second defect alluded to is the method of judging the progress in germination. The usual plan is to note with as much accuracy as possible the development of the radicle in dicotyledonous seeds, or of the radicle and plumule in monocotyledons. This method is, of course, very crude and uncertain, and much of the variation in the results obtained may be attributed to the employment of it.

In 1880, Dr. A. Pauchon published a memoir (*Rôle de la Lumière dans la Germination*) in which he criticises closely all foregoing experiments on the subject, showing their defects. He performed many experiments, with proper precautions, but judging of the germinative progress in the way above mentioned, in order to show that only doubtful results could be so obtained. He then suggests, as a measure of germinative progress, the amount of oxygen absorbed by the seeds during germination. This method is a decided improvement, since it substitutes a precise and easily observed measurement, for a rough estimation by which an approximate result can hardly be arrived at even with much trouble.

Dr. Pauchon's apparatus consisted of two wide tubes of glass, one of which was covered with folds of black paper to exclude light, the other being left clear. The two tubes were placed upright, side by side, during an experiment, the lower ends being closed by corks pushed in to a certain distance. Above the cork in each tube was placed a small vessel containing concentrated potassa solution, and above

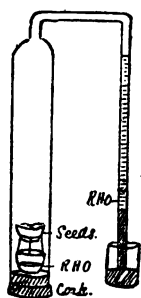


Fig. 1.

this was supported another vessel containing a pad of cotton wool saturated with water, on which the seeds were placed. A narrow tube, bent twice at right angles, issued from the upper end of each of the two wide tubes, and its open extremity was immersed in mercury. The limb of the narrow tube, above the mercury, was graduated into cubic centimetres and parts of a cubic centimetre, and the absorption in each tube was observed by the movement of the

mercury column. Fig. 1 gives the appearance of one of the tubes as fitted up.

The seeds absorbed oxygen and exhaled carbonic anhydride, which was at once fixed by the solution of potassa, producing a partial vacuum; the mercury then rose in the narrow tube, and the absorption of oxygen was measured by taking an observation and making proper allowance for temperature, pressure, and tension of aqueous vapour, and the volume of the solid and liquid contents of each apparatus. An account was also taken of the visible progress

in germination made by the seeds during an experiment. The seeds experimented upon were chiefly oleaginous and leguminous, with the exception of Indian corn, which was the only seed which approached in composition the seeds of wheat or barley.

Dr. Pauchon concludes from his experiments :—

1. That light accelerates in a constant manner the absorption of oxygen by germinating seeds in all cases.
2. That a relation exists between the degree of illumination and the quantity of oxygen absorbed.
3. That the respiratory acceleration, exercised by light, persists in obscurity for some hours.
4. That the differences between the amounts of oxygen absorbed in light and in darkness are more considerable at a low than at a high temperature.

According to the experimental record, the first conclusion seems to be well established, and in that case the second would follow almost as a matter of course. The two last conclusions do not appear to me at all clearly warranted, after a careful perusal of the experiments.

There are three possible sources of error in Dr. Pauchon's experiments. The first consists in placing the seeds on a pad of cotton saturated with water. In this case some of the rootlets may come in contact with the pad before others, and this would cause, by itself, a considerable irregularity in germination by the stimulating action of the moisture absorbed. The second source of error is the irregularity in germination caused by selecting seeds, for experiment, in which the radicle has not already burst the seed coats. The third source of error is the manner of securing similarity of temperature. The two glass vessels containing the seeds, one clear and the other covered with black paper, were placed side by side, in the air, with a thermometer between them. It does not seem to me at all certain that the thermometer indicates the actual temperature of the interior of each vessel, for the radiating powers of clear glass and black

paper are by no means the same; and any difference in the temperature of the surrounding air, or of near objects, would destroy, if only in a small degree, the equilibrium of temperature in the two vessels, which would affect the germinative activity of the seeds, and vitiate the absorption observations by unequal expansion or contraction of the enclosed air.

If the problem be considered in the light of what we already know of the active influence of light on the green parts of plants in the presence of small quantities of carbonic anhydride, one would be inclined to think that light would probably have an *apparently* retarding effect on the respiratory function of seeds. In this way,—If the seed coats be at all pervious to light, chlorophyll would be developed in the young plumula, and by the action of the light on this substance, in presence of the carbonic anhydride evolved during germination, a portion of the carbonic anhydride would disappear, and the actual quantity produced during germination would be diminished in proportion to the activity of the light. This indirect effect of light could not take place if the carbonic anhydride evolved by the seeds was removed as soon as formed. It will be seen to what extent this idea is confirmed by the test of experiment.

Method of experiment.—In my first series of experiments I made use of an apparatus similar to the one employed in former experiments on germination, and fully described in a previous paper (Chem. Soc. J., Sept. 1880). The only modification introduced is in the form of the vessel containing the seeds experimented upon. This consisted of a piece of combustion tube, worked into



Fig. 2.

the form shown in the figure (Fig. 2). The internal diameter was 13 M.M., and the length, between the

two bends, 190 M.M. A tube this size will hold about 3 grams of barley loosely disposed all along the interior. Two tubes of the kind described were used in each experiment, and the rest of the apparatus was in duplicate. The two tubes were placed side by side in a glass trough

filled with water, one of the tubes being closely covered with two or three folds of tinfoil, to exclude the light, while the other was left clear. The carbonic anhydride, evolved in each tube, was collected by absorption in the potash bulbs and weighed.

A few remarks on the respiration of germinating barley will not be out of place at this point.

During germination oxygen is absorbed and carbonic anhydride excreted, the amount of the latter gas produced being very slightly less in volume than that of the oxygen absorbed, showing that a small quantity of oxygen is retained by the corns, and is probably used up in other changes. A certain quantity of water is also produced by respiration; and I have found that a fairly definite relation exists between the weights of the carbonic anhydride and the water. The numbers obtained indicate pretty plainly the splitting up of a carbohydrate by oxidation. The carbohydrate may belong to the cane sugar group represented by the formula $C_{12}H_{22}O_{11}$, the grape sugar group $C_{12}H_{24}O_{12}$, or the starch group, $n(C_6H_{10}O_5)$.

The oxidation by respiration of these carbohydrates may be represented by the following equations, and it will be observed that no more oxygen is required than is sufficient to convert the carbon into carbonic anhydride:—

1. Cane Sugar. $C_{12}H_{22}O_{11} + 24 O = 12 CO_2 + 11 OH_2$
2. Glucose. $C_{12}H_{24}O_{12} + 24 O = 12 CO_2 + 12 OH_2$
3. Starch. $C_6H_{10}O_5 + 12 O = 6 CO_2 + 5 OH_2$

The relation of the carbonic anhydride to the water will be made simpler by taking the molecular weight of carbonic anhydride 44, as a basis, then the ratios will be:—

		CO_2	OH_2
With Cane Sugar	.	44.0	16.5
„ Glucose	.	44.0	18.0
„ Starch	.	44.0	15.0

In one set of experiments on this point, the results of which appeared in the paper referred to above, a ratio of 44 : 18.28 was obtained, while in a later series of experiments, with a different barley, the ratio was 44 : 14.43. The first result points to the splitting up of a glucose, and the last to a splitting up of a starch.

In selecting corns for experiment, a small sample was taken, and all doubtful-looking corns carefully removed. From this, two lots of identical weight, about 3 grams each, were taken, one for each tube. They were steeped in water in small beakers, at the same temperature, for the same length of time, and were again weighed before being introduced into their respective tubes. The amount of moisture absorbed during steep was about 1.7 grams in most cases, and did not vary more than 0.02 grams in each duplicate experiment. The glass trough containing the germination tubes was placed as close as possible to a window having a clear look-out to the north. During the experiment, air saturated with moisture was slowly aspirated through the apparatus, so that the corns might be continually surrounded with fresh air. The germination was usually allowed to proceed for ten days, or until the acrospire had nearly reached the end of the corns. The temperature during the whole course of the experiments ranged between $14^{\circ}2$ C. and $20^{\circ}8$ C., and was regulated by means of a thermostat. During the greater number of the experiments the temperature only varied between $15^{\circ}5$ C. and $16^{\circ}6$ C.

The potash bulbs were weighed after germination had proceeded for three days, again after another interval of three days, and finally after another interval of four days. The other parts of the apparatus, including the germination tubes, were also weighed at the same time, to show that no moisture was lost or gained by the seeds experimented upon.

[Continued on next page.

I will now give the results of seven double experiments, made during March, April, and May 1881:—

Exposed to Light.			In Obscurity.			Result in favour of Light or Obscurity.
Experiment.	Days.	CO ₂ . C.C.	Experiment.	Days.	CO ₂ . C.C.	
1A. Saale Barley, 3·014 grams,	3. 6 10	25·67 34·50 41·50	1B. Saale Barley, 3·022 grams,	3 6 10	29·27 34·95 44·85	C.C. CO. Obscurity, 8·60 Do. 0·45 Do. 8·35
Total,	..	101·67	Total,	..	109·07	Obscurity, 7·40
2A. Saale Barley, 3·037 grams,	3 6 10	40·79 43·48 47·18	2B. Saale Barley, 3·037 grams,	3 6 10	42·06 44·24 49·87	Obscurity, 1·27 Do. 0·78 Do. 2·74
Total,	..	131·40	Total,	..	136·17	Obscurity, 4·77
3A. Saale Barley, 3·040 grams,	3 6 10	40·23 41·70 47·94	3B. Saale Barley, 3·052 grams,	3 6 10	41·04 42·81 49·41	Obscurity, 0·81 Do. 0·61 Do. 1·47
Total,	..	129·87	Total,	..	132·76	Obscurity, 2·89
4A. Saale Barley, 3·029 grams,	3 6 10	43·78 41·75 52·10	4B. Saale Barley, 3·028 grams,	3 6 10	*42·46 *40·28 53·17	Light, . 1·32 Do. . 1·47 Obscurity, 1·07
Total,	..	137·63	Total,	..	135·91	Light, . 1·72
5A. Saale Barley, 3·010 grams,	3 6 10	41·95 41·14 45·56	5B. Saale Barley, 3·018 grams,	3 6 10	40·74 41·29 48·30	Light, . 1·21 Obscurity, 0·15 Do. 2·74
Total,	..	128·65	Total,	..	130·33	Obscurity, 1·63
6A. Saale Barley, 2·956 grams,	3 6 10	41·80 38·76 47·23	6B. Saale Barley, 2·936 grams,	3 6 10	41·40 40·03 46·62	Light, . 0·40 Obscurity, 1·27 Light, . 0·61
Total,	..	127·79	Total,	..	128·05	Obscurity, 0·26
7A. Saale Barley, 3·011 grams,	3 6 10	49·72 46·87 49·31	7B. Saale Barley, 3·094 grams,	3 6 10	50·63 45·81 50·12	Obscurity, 0·91 Light, . 1·06 Obscurity, 0·81
Total,	..	145·90	Total,	..	146·56	Obscurity, 0·06

Taking the totals in each double experiment, the result is as follows:—

Experiment.	Total CO ₂ produced.		Excess of CO ₂ in favour of	
	Light.	Obscurity.	Light.	Obscurity.
1.	101·67 c.c.	109·07 c.c.	...	7·40 c.c.
2.	131·40 "	136·17 "	...	4·77 "
3.	129·87 "	132·76 "	...	2·89 "
4.	137·63 "	135·91 "	1·72 c.c.	...
5.	128·65 "	130·33 "	...	1·68 "
6.	127·79 "	128·05 "	...	0·26 "
7.	145·90 "	146·56 "	...	0·66 "
Totals,	902·91 c.c.	918·85 c.c.	1·72 c.c.	17·66 c.c.

Total excess of carbonic anhydride produced in favour of obscurity is 15·94 c.c., or an increase in favour of obscurity

also is amount of CO_2 used in exp.
43% greater for those in dark than for
those in the light.

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of 1.75 per cent. on the mean of the total quantity of carbonic anhydride produced.

Of the seven double experiments, six show an increase in respiration in favour of obscurity, and one only in favour of light.

Out of the twenty-one separate observations made during the course of these experiments, fifteen show the greatest activity in obscurity, and the remaining six point to light as being a stimulating agent. I must remark here that two of the observations recorded in experiment 4B, and marked with an asterisk, are probably vitiated by a leakage which was found at one of the joints in apparatus, which would have the effect of diminishing somewhat the current of air which passed over the germinating barley, and the quantity of carbonic anhydride collected would be lessened in consequence.

Though, as a rule, there appears to be more carbonic anhydride evolved in darkness during germination, yet the increase, as shown by the foregoing experiments, is exceedingly variable in amount, and is altogether so slight that it is more than doubtful whether one is justified in taking the arithmetical mean of so few as seven experiments to express the truth. That identity in the conditions of moisture and temperature were secured in each double experiment can hardly be doubted. The only source of variation which remains is the difference in the samples of barley and in the constitution of individual corns, a difference which it is impossible to detect, much more to avoid. This difference in the samples of barley used, if not great, say about equal in effect at the most, to the retarding influence of light would in some experiments exaggerate the results in favour of obscurity and in others tend to neutralise them altogether, the results varying with the degree of difference between the samples of barley.

At the end of each experiment the corns were all carefully examined. I did not meet with any still or dead corns during all the experiments. There was little or no difference in the outward appearance of two samples, one grown in darkness and the other in strong diffused light, at the end of ten days; but on dissecting the corns it was found that while the interior of the primitive sheath of the

plumula was of a pale yellow colour in the corns grown in obscurity, the colour of the same part in the corns grown under the influence of light was a dark green.

Not being satisfied with the results already obtained, I resolved to try a different method of experiment. I thought that if the observations could be made volumetrically as to the amount of carbonic anhydride produced, greater accuracy might be attained. With this object in view I devised and fitted up an apparatus similar in principle to that employed by Dr. Pauchon, and alluded to on a previous page. There is, however, considerable difference in the details and in the manner of experiment.

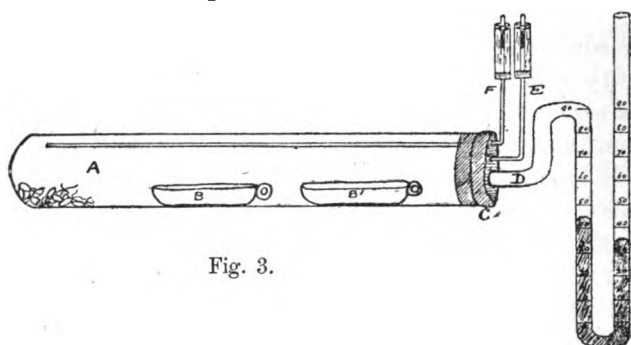


Fig. 3.

DESCRIPTION OF THE APPARATUS, Fig. 3.—A, a large strong glass tube (about 140 c.c. capacity) closed at one end. The open end of the tube is closed by an india-rubber cork, C. This cork is always pushed to the same distance, shown by marks scratched on the glass tube. The cork has three perforations to carry three tubes, D, E, and F. D has an internal diameter of 8 m.m., and is bent in the form shown in the figure. It is graduated on both limbs from 0 to 90 m.m. E and F are two capillary tubes; F reaches nearly to the end of the tube A, while E is terminated level with the inner surface of the cork. The upper ends of both these tubes are closed by stoppers covered by a water joint. Their use is for replenishing the air in the large tube as often as it is considered necessary. B and B¹ are two porcelain spoon boats; B contains a measured quantity (about 1·3 c.c.) of distilled water, and B¹ about the same amount of potassa solution. The corns experimented upon are placed near the closed end of the tube.

A duplicate to this piece of apparatus, similar in every respect, was prepared, but light was excluded from its interior by an external coating of very thin sheet brass. The two tubes were fixed in an appropriate holder, and the whole was immersed under the surface of water, with only the open upper ends of the graduated tubes and the water joints protruding. The trough itself was placed in strong diffused light in a small greenhouse facing the north. Both pieces of apparatus were carefully calibrated.

METHOD OF EXPERIMENT.—A sample of the corn, about 50 grams of barley or wheat, was taken and placed in a beaker. The corn was covered with water from thirty-six to seventy-five hours, changing the water at intervals. The water was then drained off the seeds, and they were placed in a glazed earthenware jar, covered with an opaque plate, and allowed to germinate for periods varying from two to eight days. At the stage fixed on for experiment the jar was opened and the sample turned out. Thirty corns, or thereabout, were then selected for each tube, the greatest pains being taken to ensure similarity in the size, weight, and progress in germination of the two samples. It was hoped by employing this method of selecting the corns to eliminate in some degree the variations caused by differences in the samples employed for experiment. After being weighed, the samples were introduced into their separate tubes, as shown in the figure, and the apparatus was immersed. After a short interval, to establish equilibrium of temperature, readings were taken on the limbs of the tube D, which is half filled with quicksilver, and the volume of the enclosed air was deduced after allowing for temperature, pressure, tension of aqueous vapour, and the volume of the seeds, as well as that of the two boats with their liquid contents. The volume occupied by the corns was ascertained by finding the specific gravity of a separate portion of the same sample. The readings were repeated at suitable intervals. The reduction in volume between each observation gave the amount of oxygen absorbed by the seeds, the carbonic anhydride produced being absorbed, as soon as formed, by the potassa solution in the boat B¹. When it was required to change the air in the tubes, which was usually done immediately after an observation of the

absorption, the stoppers of the tubes E and F were removed; F was connected with an aspirator, and E with an apparatus for purifying the air and saturating it with moisture. About 1 litre of air was drawn through each tube at one time, the operation occupying about ten minutes. The stoppers were then replaced, and the volume of the contained air immediately ascertained.

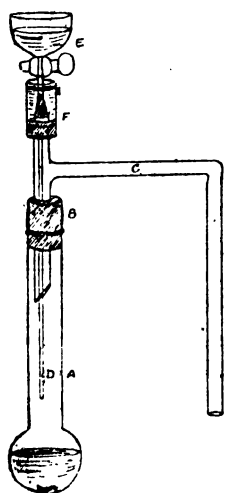


Fig. 4.

The quantity of carbonic anhydride, produced by the seeds, was found at the end of the experiment in the following way:—The contents of the two boats B and B¹, from each of the two tubes, were washed into two small flasks, like A in Fig. 4, with distilled water.

Each flask was, in turn, fitted with an indiarubber cork, B, perforated by the wide tube C, which was connected with a Sprengel's mercury pump. A tap funnel, E, containing recently boiled dilute sulphuric acid

tinged with litmus communicated with the interior of the flask by the narrow tube, D, which passes down the axis of the broad tube C. As soon as a vacuum had been obtained, the acid solution in the funnel was *cautiously* run into the flask till the contents were pink in colour. The pump was then worked, and the flask exhausted as far as possible, the carbonic anhydride being collected in a tube over mercury. Gentle heat was then applied to the liquid, which caused it to boil briskly. It was found very advantageous to put a small piece of platinum foil, previously ignited, into the flask to prevent bumping. The source of heat was then withdrawn, and the pump worked till a vacuum was again produced, at which stage heat was applied once more, and the pump was set in action as previously. This operation was repeated until a vacuum was obtained within a few seconds after boiling the liquid. By proper attention to these details, the carbonic anhydride expelled from the liquid can be obtained nearly free from water in the collecting

tube. The gas, which consists of carbonic anhydride, with a slight admixture of air, was analysed in the usual way in a Frankland's gas apparatus. A deduction was made from the quantity of carbonic anhydride found, to allow for that which was originally present in the potassa solution employed. The quantity of carbonic anhydride found, subtracted from the total quantity of oxygen absorbed during an experiment, gave the amount of oxygen absorbed and retained by the seeds.

These experiments were conducted at intervals during 1883, 1884, and 1885. Three blank experiments were tried with the apparatus placed in a *dark* room, and fitted up as described. The results thus obtained are tabulated on the next page.

BLANK EXPERIMENTS—IN OBSCURITY.

EXPERIMENT.	Observations during Germination.					Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.		
	Temperature.	Interval.	Oxygen utilised.			A. Clear Tube.	B. Covered Tube.	Excess in favour of	A. Clear Tube.	B. Covered Tube.	Excess in favour of
			A. Clear Tube.	B. Covered Tube.	Excess in favour of						
1A. and 1B. White Hungarian Barley, 1882. Weight—{1A., 1.87 grams. {1B., 1.84 " " 30 Corns each. Germinated 4 days. Steeped 70 hours.	15.1 to 21.7 °C.	Hours.									
		22½	C.C.	C.C.	C.C.						
		22½	5.52	5.65	Covered, . 0.13						
		22½	4.86	5.03	Do. . 0.17						
		24½	4.86	4.62	Uncovered, 0.24						
2A. and 2B. Yellow English Barley, 1882. Weight—{2A., 2.32 grams. {2B., 2.33 " " 30 Corns each. Steeped 68 hours. Germinated 8 days.	14.5 to 16.5	23½									
		23½	7.22	7.31	Covered, . 0.09						
		23½	5.89	6.09	Do. . 0.20						
		24½	7.27	7.47	Do. . 0.20						
			20.38	20.87	Covered, . 0.49						
3A. and 3B. Yellow English Barley, 1882. Weight—{3A., 2.14 grams. {3B., 2.14 " " 30 Corns each. Steeped 66 hours. Germinated 4 days.	14.3 to 16.0	22	6.61	6.80	Covered, . 0.19						
		23½	6.26	6.38	Do. . 0.12						
		23½	5.84	5.78	Clear, . 0.06						
		23½	4.78	4.56	Do. . 0.22						
		24½	5.08	4.96	Do. . 0.12						
			28.57	28.48	Clear, . 0.09						
						19.76	20.11	Covered, 0.35	0.62	0.76	Covered, 0.14
						25.75	25.91	Covered, 0.16	2.82	2.57	Clear, 0.25

A glance at the preceding Table shows that there is not much difference in the results obtained in the two tubes, when the whole apparatus is kept in the dark. In the case of "Oxygen utilised," the differences are pretty equally distributed in favour of either tube; but in the case of "Carbonic Anhydride produced" there appears to be a slight increase in favour of the covered tube in each experiment. These results may be more clearly seen by collecting the totals as before:—

Experiment.	Total Oxygen utilised.		Excess in favour of	
	Clear Tube.	Covered Tube.	Clear Tube.	Covered Tube.
1.	28·87 c.c.	28·48 c.c.	0·39 c.c.	...
2.	20·88 "	20·87 "	...	0·49 c.c.
3.	28·57 "	28·48 "	0·09 "	...
Totals,	<u>72·82 c.c.</u>	<u>72·83 c.c.</u>	<u>...</u>	<u>0·01 c.c.</u>

Experiment.	Total CO ₂ produced.		Excess in favour of
	Clear Tube.	Covered Tube.	Covered Tube.
1.	22·06 c.c.	22·08 c.c.	0·02 c.c.
2.	19·76 "	20·11 "	0·35 "
3.	25·75 "	25·91 "	0·16 "
Totals,	<u>67·57 c.c.</u>	<u>68·10 c.c.</u>	<u>0·53 c.c.</u>

The total quantity of oxygen utilised by the seeds in the three experiments is nearly identical in both tubes. The totals of carbonic anhydride produced show a small increase of 0·53 c.c. in favour of the covered tube, equal to 0·78 per cent. on the mean of the total quantity of carbonic anhydride formed. There is hardly any doubt that this increase would be considerably lowered if the mean of a larger number of experiments were taken.

Considering these results as a sufficient test of the efficiency of the apparatus, I may now give, in a tabular form, the results obtained when strong diffused light was admitted to the clear tube.

TABLE OF EXPERIMENTAL RESULTS.

EXPERIMENT.	Observations during Germination.					Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.				
	Temperature. °C.	Interval.	Oxygen utilised.			Excess in favour of	A. Light.	B. Obscurity.	Excess in favour of	A. Light.	B. Obscurity.	Excess in favour of	
			A. Light.	B. Obscurity.	C.C.								
1A. and 1B. Saale Barley, 1880. Weight—{ 1A., 3.78 grams. { 1B., 3.71 " 60 Corns each. Steeped 62 hours. Germinated 1 day.	12.0 to 19.5	Hours.											
		12½	C.C.	C.C.	C.C.								
		3½	...	3.70	...								
		6½	...	1.02	...								
		18	...	2.78	...								
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	9	2.49	2.22	Light, . 0.27								
		10½	2.47	2.25	Do. . 0.22								
		4	0.94	0.99	Obscurity, 0.05								
		8	1.89	1.80	Light, . 0.09								
		11½	2.23	2.27	Obscurity, 0.04								
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	4½	1.26	1.06	Light, . 0.20								
		7½	1.99	1.86	Do. . 0.13								
		11½	2.42	2.26	Do. . 0.16								
		4½	0.98	0.85	Do. . 0.08								
		8	1.54	1.37	Do. . 0.17								
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	18	2.60	2.45	Do. . 0.15								
		4½	1.11	1.00	Do. . 0.11								
		7½	1.78	1.64	Do. . 0.14								
		23.65	22.02	Light, . 1.63									
		23.65	22.02	Light, . 1.63									
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	11½	1.26	1.06	Light, . 0.20								
		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
		11½	0.98	0.85	Do. . 0.08								
		4½	1.54	1.37	Do. . 0.17								
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		4½	1.11	1.00	Do. . 0.11								
		7½	1.78	1.64	Do. . 0.14								
		23.65	22.02	Light, . 1.63									
		23.65	22.02	Light, . 1.63									
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	11½	1.26	1.06	Light, . 0.20								
		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
		11½	0.98	0.85	Do. . 0.08								
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		4½	1.11	1.00	Do. . 0.11								
		7½	1.78	1.64	Do. . 0.14								
		23.65	22.02	Light, . 1.63									
		23.65	22.02	Light, . 1.63									
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		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
		11½	0.98	0.85	Do. . 0.08								
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		4½	1.11	1.00	Do. . 0.11								
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		23.65	22.02	Light, . 1.63									
		23.65	22.02	Light, . 1.63									
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	11½	1.26	1.06	Light, . 0.20								
		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
		11½	0.98	0.85	Do. . 0.08								
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		4½	1.11	1.00	Do. . 0.11								
		7½	1.78	1.64	Do. . 0.14								
		23.65	22.02	Light, . 1.63									
		23.65	22.02	Light, . 1.63									
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	11½	1.26	1.06	Light, . 0.20								
		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
		11½	0.98	0.85	Do. . 0.08								
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		4½	1.11	1.00	Do. . 0.11								
		7½	1.78	1.64	Do. . 0.14								
		23.65	22.02	Light, . 1.63									
		23.65	22.02	Light, . 1.63									
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		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
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		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
		11½	0.98	0.85	Do. . 0.08								
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		4½	1.11	1.00	Do. . 0.11								
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		23.65	22.02	Light, . 1.63									
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		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
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		4½	1.99	1.86	Do. . 0.13								
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		23.65	22.02	Light, . 1.63									
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2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	11½	1.26	1.06	Light, . 0.20								
		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
		11½	0.98	0.85	Do. . 0.08								
		4½	1.54	1.37	Do. . 0.17								
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	18	2.60	2.45	Do. . 0.15								
		4½	1.11	1.00	Do. . 0.11								
		7½	1.78	1.64	Do. . 0.14								
		23.65	22.02	Light, . 1.63									
		23.65	22.02	Light, . 1.63									
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	11½	1.26	1.06	Light, . 0.20								
		4½	1.99	1.86	Do. . 0.13								
		7½	2.42	2.28	Do. . 0.16								
		11½	0.98	0.85	Do. . 0.08								
		4½	1.54	1.37	Do. . 0.17								
2A. and 2 B. English Barley, 1882. Weight—{ 1A., 1.97 grams. { 1B., 1.97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11.9 to 18.0	18	2.60	2.45	Do. . 0.15								
		4½	1.11	1.00	Do. . 0.11								
		7½	1.78	1.64	Do. . 0.14								
		23.65	22.02	Light, . 1.63									
		23.65	22.02	Light, . 1.63									

TABLE OF EXPERIMENTAL RESULTS—continued.

EXPERIMENT.	Observations during Germination.					Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.			
	Temperature.	Interval.	Oxygen utilised.			Excess in favour of	A. Light.	B. Obscurity.	A. Light.	B. Obscurity.	Excess in favour of	
			A. Light.	B. Obscurity.	C.C.							
3A. and 3B. English Barley, 1882. Weight— $\sqrt{A, 2.18 \text{ grams.}}$ $\sqrt{B, 2.11 \text{ "}}$ 30 corns each. Steeped 72 hours. Germinated 4 days.	12.5 to 19.6	Hours.	C.C.	C.C.	C.C.	Light, .	0.21					
		7 1/2	3.75	3.64	Light, .	0.18						
		11 1/2	3.13	2.95	Do. .	0.05						
		4 1/2	1.21	1.26	Obscurity, .	0.14						
		7 1/2	2.12	1.98	Light, .	0.07						
		11 1/2	2.88	2.95	Obscurity, .	0.04						
		4 1/2	1.13	1.09	Light, .	0.18						
		8 1/2	2.51	2.33	Do. .	0.10						
		10 1/2	2.94	2.84	Do. .	0.01						
		5	1.27	1.26	Do. .	0.19						
6	1.94	1.75	Do. .	Light, .	0.93							
4A. and 4B. English Barley, 1882. Weight— $\sqrt{A, 2.12 \text{ grams.}}$ $\sqrt{B, 2.03 \text{ "}}$ 30 Corns each. Steeped 70 hours. Germinated 5 days.	13.3 to 19.8	12 1/2	3.81	3.73	Light, .	0.08						
		10	3.18	3.00	Do. .	0.18						
		16 1/2	3.47	3.40	Do. .	0.07						
		10 1/2	2.60	2.55	Do. .	0.05						
		12 1/2	2.13	2.28	Obscurity, .	0.17						
		8 1/2	2.34	2.27	Light, .	0.07						
		11 1/2	2.36	2.38	Obscurity, .	0.02						
		6 1/2	1.48	1.48	Equal.							
			21.87	21.09	Light, .	0.28						

TABLE OF EXPERIMENTAL RESULTS—continued.

EXPERIMENT.	Observations during Germination.				Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.				
	Temperature.	Interval.	Oxygen utilised.		Excess in favour of	A. Light.	B. Obscurity.	Excess in favour of	A. Light.	B. Obscurity.	Excess in favour of	
			A. Light.	B. Obscurity.								
5A. and 5B. English Barley, 1882. Weight—{A., 2.28 grams. " {B., 2.19 " 30 Corns each. Steeped 72 hours. Germinated 8 days.	12.8 to 21.0	Hours.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	
		12	4.71	4.60	Light, . 0.11							
		94	3.98	3.82	Do. . 0.11							
		134	4.88	4.66	Do. . 0.22							
		94	3.07	2.89	Do. . 0.18							
		134	2.99	2.79	Do. . 0.20							
		74	2.12	1.80	Do. . 0.32							
		144	3.48	3.24	Do. . 0.24							
		10	3.04	2.95	Do. . 0.09							
			28.22	26.75	Light, . 1.47							
6A. and 6B. English Barley, 1882. Weight—{A., 2.05 grams. " {B., 2.10 " 30 Corns each. Steeped 72 hours. Germinated 64 days.	12.5 to 21.2	124	2.96	3.00	Obscurity, 0.04							
		94	2.18	1.96	Light, . 0.22							
		144	2.65	2.41	Do. . 0.24							
		184	2.79	2.78	Do. . 0.01							
		15	2.40	2.88	Do. . 0.48							
		234	4.05	4.21	Obscurity, 0.16							
		25	5.90	5.69	Light, . 0.21							
			22.98	22.43	Light, . 0.50							
			6.83	6.25	Light, . 0.08							
			7.73	7.46	Do. . 0.27							
7A. and 7B. Austrian Barley, 1882. Weight—{A., 2.11 grams. " {B., 2.06 " 30 Corns each. Steeped 72 hours. Germinated 8 days.	18.5 to 20.6	164	6.83	6.25	Light, . 0.08							
		224	7.73	7.46	Do. . 0.27							
		244	6.79	6.71	Do. . 0.08							
		23	5.69	5.69	Equal.							
			26.54	26.11	Light, . 0.43							
			25.27	25.12	Light, 0.15							
			25.27	25.12	Light, 0.15							
			1.27	0.99	Light, 0.28							
			21.74	21.58	Light, 0.16							
			21.74	21.58	Light, 0.16							

TABLE OF EXPERIMENTAL RESULTS—continued.

EXPERIMENT.	Observations during Germination.					Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.		
	Temperature. °C.	Interval.	Oxygen utilised.			A. Light.	B. Obscurity.	Excess in favour of	A. Light.	B. Obscurity.	Excess in favour of
			A. Light.	B. Obscurity.	Excess in favour of C.C.						
8A. and 8B. Austrian Barley, 1882. Weight—{A, 1.39 grams. {B, 1.97 " } 30 Corns each. Steeped 75 hours. Germinated 3 days.	15.9 to 20.0	Hours.									
		17½	C.C.	C.C.	C.C.						
		23½	5.86	5.73	Light, . 0.18						
		23½	8.94	7.92	Do. . 0.42						
		24	6.78	6.44	Do. . 0.34						
			6.41	6.08	Do. . 0.33						
			27.39	26.17	Light, . 1.22						
						C.C.	C.C.	C.C.	C.C.	C.C.	C.C.
						25.02	23.80	Light, 1.22	2.37	2.37	Equal.
9A. and 9B. White Hungarian Barley, 1882. Weight—{A, 1.94 grams. {B, 2.00 " } 30 Corns each. Steeped 72 hours. Germinated 3 days.	13.8 to 19.0	18½	6.61	6.26	Light, . 0.35						
		23½	6.13	5.69	Do. . 0.44						
		23½	4.94	4.64	Do. . 0.30						
		23½	5.03	4.79	Do. . 0.24						
			22.71	21.41	Light, . 1.30						
						20.69	Lost	...	2.02	Lost	...
10A. and 10B. Yellow English Barley, 1882. Weight—{A, 2.16 grams. {B, 2.20 " } 30 Corns each. Steeped 60 hours. Germinated 5 days.	17.3 to 22.0	28½	B.	A.	Light, . 0.37						
		24½	6.70	6.81	Do. . 0.39						
		21½	7.86	7.15	Do. . 0.71						
			26.97	25.50	Light, . 1.47						
						B.	A.	Light, 1.47	B.	A.	Equal.
						26.13	24.66		0.84	0.84	
11A. and 11B. White Hungarian Barley, 1882. Weight—{A, 1.66 grams. {B, 1.94 " } 30 Corns each. Steeped 72 hours. Germinated 3 days.	16.0 to 20.0	25½	7.75	7.05	Light, . 0.70						
		28½	6.76	6.28	Do. . 0.48						
		19½	8.37	8.50	Do. . 0.37						
		18½	8.66	8.22	Do. . 0.44						
		27½	4.77	4.47	Do. . 0.30						
			26.81	24.52	Light, . 2.29						
						25.16	22.78	Light, 2.38	1.65	1.74	Obscurity, 0.09

In these experiments on different kinds of barley, the large majority of the observations, during germination, as to the amount of oxygen utilised by the corns, points to a small but variable increased activity under the influence of strong diffused light. Of the sixty-six observations recorded on this point, fifty-six are in favour of light, eight in favour of obscurity, and two show an equality.

Of the total quantity of oxygen utilised in each experiment, the results show a small variable increase in favour of light in every case:—

Experiment.	Total Quantity of Oxygen utilised.		Excess in favour of
	Light.	Obscurity.	Light.
2.	23·65 c.c.	22·02 c.c.	1·63 c.c.
3.	22·88 "	21·95 "	0·93 "
4.	21·37 "	21·09 "	0·28 "
5.	28·22 "	26·75 "	1·47 "
6.	22·93 "	22·43 "	0·50 "
7.	26·64 "	26·11 "	0·43 "
8.	27·39 "	26·17 "	1·22 "
9.	22·71 "	21·41 "	1·30 "
10.	26·97 "	25·60 "	1·47 "
11.	26·81 "	24·52 "	2·29 "
Totals,	<u>249·47 c.c.</u>	<u>237·95 c.c.</u>	<u>11·52 c.c.</u>

The *total* excess of oxygen utilised, in favour of light, in all the experiments amounts to 11·52 c.c., or an increase of 4·73 per cent. on the mean of the total quantity of oxygen utilised, 243·71 c.c.

Of the ten experiments in which the carbonic anhydride produced was determined, all show a small variable increase in favour of the corns grown under the influence of light.

Experiment.	Carbonic Anhydride produced.		Excess in favour of
	Light.	Obscurity.	Light.
1.	27·59 c.c.	26·53 c.c.	1·06 c.c.
2.	19·72 "	19·46 "	1·26 "
3.	20·77 "	20·05 "	0·72 "
4.	20·76 "	20·52 "	0·24 "
5.	25·85 "	24·11 "	1·74 "
6.	21·74 "	21·58 "	0·16 "
7.	25·27 "	25·12 "	0·15 "
8.	25·02 "	23·80 "	1·22 "
10.	26·13 "	24·66 "	1·47 "
11.	25·16 "	22·78 "	2·38 "
Totals,	<u>238·01 c.c.</u>	<u>228·61 c.c.</u>	<u>9·40 c.c.</u>

The *total* excess of carbonic anhydride produced, in favour of light, in all the experiments is 9·40 c.c., or an increase of 4·03 per cent. on the mean of the total quantity of carbonic anhydride produced, *i.e.* 233·31 c.c.

The amount of oxygen *absorbed* and *retained* by the seeds varied very much, and indefinitely, in the different experiments. Of the nine double results recorded, five are in favour of light, two in favour of obscurity, and in two equality was observed.

Experiment.	Oxygen absorbed and retained:		Excess in favour of	
	Light.	Obscurity.	Light.	Obscurity.
2.	3.98 c.c.	2.56 c.c.	1.37 c.c.	...
3.	2.11 "	1.90 "	0.21 "	...
4.	0.61 "	0.57 "	0.04 "	...
5.	2.37 "	2.64 "	...	0.27 c.c.
6.	1.19 "	0.85 "	0.34 "	...
7.	1.27 "	0.99 "	0.28 "	...
8.	2.37 "	2.37 "	Equal	Equal
10.	0.84 "	0.84 "	Equal	Equal
11.	1.65 "	1.74 "	...	0.09 c.c.

On comparing the mean rate of increase in the carbonic anhydride produced in favour of light, as determined by this series of experiments, with the rate obtained in the first series of experiments (where the carbonic anhydride was weighed), it will be at once seen that it is rather more than twice as great, and is, moreover, in the opposite direction. That is to say, in the first series of experiments an excess of carbonic anhydride was produced in favour of obscurity, and in the second series a greater excess of carbonic anhydride was produced in favour of light. I can only account for this discrepancy in the results in the following way:—

In the first series of experiments a larger number of seeds was employed; these were confined in a narrow tube, through which air was slowly aspirated. It is evident that the air present in the tube must be contaminated to a small extent with the carbonic anhydride produced by the germinating seeds. On calculating the amount of this contamination, from the quantities of air aspirated and carbonic anhydride excreted, it was found to vary from 0.58 per cent. to 1.26 per cent. during the different experiments. It is possible that the influence of light on the seeds in the exposed tube, in presence of this small quantity of carbonic anhydride, may have tended, by its partial decomposition, to diminish the observed amount of carbonic anhydride excreted, though the results, when compared with the degree of contamination in each experiment, do not show any corresponding variation in the

quantity of carbonic anhydride excreted. If this variation exists, it was overshadowed by the effect of unavoidable differences in the samples of barley, or by some other unknown cause. The main fact remains, that all the experiments show a slight increase of germinative respiration in the samples of barley grown in obscurity.

In the second series of experiments (in which the carbonic anhydride was measured volumetrically) the seeds were placed in a large tube with about 120 c.c. of air, and potassa solution was present in the tube, to absorb the carbonic anhydride as it was produced. The average quantity of carbonic anhydride produced in twenty-four hours throughout the experiments would be about 6 c.c. (varying from 4 to 8 c.c.), which would give 0.25 c.c. per hour, and there can be no doubt that the greater part of this quantity would be absorbed by the potassa solution in the same time, *i.e.* one hour. It is evident, therefore, that the contamination of the air by the presence of unabsorbed carbonic anhydride must be very slight indeed, and far below that which obtained in the first series of experiments, and also that the disturbing effect of such contamination on the results would be absent in the second series.

In order to test this theory, I performed a few additional experiments with the same apparatus used in the second series, but instead of absorbing the carbonic anhydride as it was formed, I allowed it to remain in contact with the seeds. At the end of each experiment, a portion of the air was withdrawn from each tube, and a measured quantity analysed, to determine the quantity of carbonic anhydride produced in each tube. The following are the results obtained in this way:—

EXPERIMENT.	Carbonic Anhydride produced.		Excess in favour of
	A. Light.	B. Obscurity.	
1A. and 1B. Yellow English Barley, 1882. Weight— {A., 2.11 grams. {B., 2.08 " 30 Corns each. Steeped 72 hours. Germinated 4 days.	C.C.	C.C.	C.C.
	15.24	15.50	Obscurity, 0.26
2A. and 2B. Yellow English Barley, 1882. Weight— {A., 2.23 grams. {B., 2.26 " 30 Corns each. Steeped 72 hours. Germinated 8 days.	11.83	11.01	Light, . 0.82
3A. and 3B. Yellow English Barley, 1882. Weight— {A., 2.34 grams. {B., 2.37 " 30 Corns each. Steeped 72 hours. Germinated 8 days.	18.16	18.97	Obscurity, 0.81
4A. and 4B. Yellow English Barley, 1882. Weight— {A., 2.20 grams. {B., 2.14 " 30 Corns each. Steeped 72 hours. Germinated 6 days.	18.85	19.40	Obscurity, 0.55
5A. and 5B. Saale Barley, 1880. Weight— {A., 2.08 grams. {B., 2.09 " 30 Corns each. Steeped 72 hours. Germinated 4 days.	17.62	17.24	Light, . 0.38
6A. and 6B. Saale Barley, 1880. Weight— {A., 2.10 grams. {B., 2.14 " 30 Corns each. Steeped 72 hours. Germinated 8 days.	18.76	18.83	Light, . 0.43
7A. and 7B. Yellow English Barley, 1882. Weight— {A., 2.20 grams. {B., 2.17 " 30 Corns each. Steeped 70 hours. Germinated 5 days.	14.86	14.74	Light, . 0.12
8A. and 8B. Yellow English Barley, 1882. Weight— {A., 2.10 grams. {B., 2.17 " 30 Corns each. Steeped 70 hours. Germinated 11 days.	12.93	14.03	Obscurity, 1.10
Totals,	127.75	129.22	Obscurity, 1.47

In these experiments four results are recorded in favour of light and four in favour of obscurity; though the excess in favour of obscurity is rather more than twice as great as that recorded in favour of light.

This leaves a total excess of carbonic anhydride produced in favour of obscurity of 1.47 c.c., or 1.14 per cent. on the mean of the total quantity of carbonic anhydride produced in all the experiments.

The rate of increased activity in favour of obscurity, thus obtained, approaches in amount that found in the first series of experiments.

This result, if considered trustworthy, seems to bear out the explanation given above of the considerable discrepancy between the evidence afforded by the results of the first and second series of experiments as to the influence of light on the respiration of germinating barley.

A noteworthy point in this third series of experiments is the fact that although the contamination of the air by carbonic anhydride is much greater than it was in the first series, yet its effect in masking the stimulating action of light is not increased, as might reasonably be expected would be the case. The only part of the seed which would probably have the power of decomposing carbonic anhydride in presence of light is the young plumula, and the quantity of this gas which it would be able to decompose would certainly be very small, so it might happen that when the amount of carbonic anhydride present in the air is above a certain point it ceases to have an increased effect in diminishing the observed quantity of the gas which is produced by the seeds when germinated under the influence of light.

It seems fair to conclude from a consideration of all the results obtained that light has probably a small stimulating action on the respiration of germinating barley, resulting in an increase of between 3 and 4 per cent. in the quantity of carbonic anhydride excreted; and that this increased activity is lost sight of when the air surrounding the seeds is contaminated, even in a small degree, by carbonic anhydride.

I made a few experiments to ascertain the influence of light on the respiration of germinating wheat, employing

for the purpose the same apparatus that was used in the second and third series of experiments on barley.

In the six following experiments, the carbonic anhydride was absorbed by potassa solution as soon as formed, and the absorption of oxygen by the seeds was noted from time to time, as in the second series of experiments with barley :—

TABLE OF EXPERIMENTAL RESULTS.

EXPERIMENT.	Observations during Germination.					Total Carbonic Anhydride produced.		
	Temperature.	Interval.	Oxygen utilised.			A. Light.	B. Obscurity	Excess in favour of
			A. Light.	B. Obscurity	Excess in favour of			
1A. and 1B. White Wheat, 1882. Weight— {A., 2.04 grams. {B., 2.01 " 30 Corns each. Steeped 50 hours. Germinated 3 days.	19.6 to 22.3 °C.	17½ 23½ 24 22½ Hrs.	C.C. 5.91 7.24 7.28 7.49 C.C.	C.C. 6.15 7.27 6.64 6.08 C.C.	Obscurity, 0.24 Do. 0.03 Light, . 0.64 Do. . 0.14 Light, . 1.83	28.50	27.17	Light, 1.33
2A. and 2B. White Wheat, 1883. Weight— {A., 1.47 grams. {B., 1.53 " 20 Corns each. Steeped 50 hours. Germinated 2½ days.	16.3 to 18.3 °C.	25 28½ 18½ 27½ 18½ Hrs.	6.40 6.27 4.09 5.99 8.08 C.C.	6.61 6.27 4.08 5.75 2.73 C.C.	Obscurity, 0.21 Equal Obscurity, 0.01 Light, . 0.24 Do. . 0.30 Light, . 0.34	25.69	25.70	Obscurity, 0.01
3A. and 3B. White Wheat, 1883. Weight— {A., 1.41 grams. {B., 1.48 " 20 Corns each. Steeped 37 hours. Germinated 3 days.	19.3 to 22.6 °C.	16 24½ 24 Hrs.	3.72 4.95 4.77 13.44 C.C.	3.68 4.84 4.29 12.81 C.C.	Light, . 0.04 Do. . 0.11 Do. . 0.48 Light, . 0.68	12.57	Lost	Light (?)
4A. and 4B. White Wheat, 1883. Weight— {A., 1.43 grams. {B., 1.84 " 20 Corns each. Steeped 24 hours. Germinated 3½ days.	18.5 to 20.6 °C.	17½ 23½ 23½ 24 Hrs.	3.20 3.54 3.98 3.45 14.17 C.C.	3.03 3.01 3.17 2.77 11.98 C.C.	Light, . 0.17 Do. . 0.53 Do. . 0.81 Do. . 0.68 Light, . 2.19	Lost	12.20	Light (?)
5A. and 5B. Red Wheat, 1884. Weight— {A., 1.54 grams. {B., 1.49 " 20 Corns each. Steeped 86 hours. Germinated 4 days.	14.3 to 18.1 °C.	24½ 18 30½ 16½ Hrs.	4.37 2.38 4.12 2.91 13.78 C.C.	4.41 2.71 4.08 2.94 14.14 C.C.	Obscurity, 0.04 Do. 0.33 Light, . 0.04 Obscurity, 0.03 Obscurity, 0.36	13.67	14.60	Obscurity, 0.93
6A. and 6B. Red Wheat, 1884. Weight— {A., 1.47 grams. {B., 1.46 " 20 Corns each. Steeped 37 hours. Germinated 4 days.	10.5 to 14.0 °C.	24½ 24½ 48 Hrs.	3.61 2.69 5.56 11.86 C.C.	3.50 2.76 5.47 11.73 C.C.	Light, . 0.11 Obscurity, 0.07 Light, . 0.09 Light, . 0.18	12.71	13.11	Obscurity, 0.40

The results obtained in this rather imperfect series of experiments are too few in number to justify taking an average. They show, broadly, for white wheat an increased activity in the respiration under the influence of light; but in the case of red wheat, in the two experiments recorded, there appears to be a small increase in the oxygen absorbed and carbonic anhydride excreted in favour of the samples grown in darkness.

These experiments, though they can hardly be considered decisive as to the action of light, bring to notice a peculiarity in the respiration of wheat which I have never met with in barley, that is, the volume of carbonic anhydride excreted generally exceeds in volume the amount of oxygen absorbed by the seeds. In the case of barley there is always more oxygen absorbed than carbonic anhydride excreted. This peculiarity of wheat certainly deserves further study.

It is more than probable that a portion at least of the oxygen absorbed by germinating wheat is retained, and does not appear again as carbonic anhydride, as is the case with germinating barley. If this is so, a considerable percentage of the carbonic anhydride excreted by germinating wheat cannot be accounted for as derived from the splitting up of a carbohydrate, and we must look to more complicated bodies, probably some of the nitrogenous compounds, for its source.

As with barley, I made a few experiments to determine the action of light on the respiration of germinating wheat, when the carbonic anhydride excreted was allowed to remain in contact with the seeds. Contrary to expectation, white wheat still showed an increased activity in respiration under the influence of light, and red wheat still showed a little in favour of obscurity:—

EXPERIMENT.	Carbonic Anhydride produced.		Excess in favour of
	A. Light.	B. Obscurity.	
1A. and 1B. White Wheat, 1883. Weight— {A., 1.40 grams. {B., 1.44 ,, { 20 Corns each. { Steeped 24 hours. { Germinated 4 days.	C.C. 12.36	C.C. 11.79	C.C. Light, . 0 57

EXPERIMENT.	Carbonic Anhydride produced.		Excess in favour of
	A. Light.	B. Obscurity.	
2A. and 2B. White Wheat, 1883. Weight— {A., 1.44 grams. {B., 1.86 " 20 Corns each. Steeped 24 hours. Germinated 4½ days.	c.c. 13.76	c.c. 12.59	c.c. Light, . 1.17
3A. and 3B. Red Wheat, 1884. Weight— {A., 1.47 grams. {B., 1.45 " 20 Corns each. Steeped 47 hours. Germinated 5 days.	7.75	7.37	Light, . 0.88
4A. and 4B. Red Wheat, 1884. Weight— {A., 1.47 grams. {B., 1.49 " 20 Corns each. Steeped 38 hours. Germinated 6 days.	7.67	8.27	Obscurity, 0.60

If these experiments on wheat were considerably multiplied, using rather larger quantities of the seed, no doubt a more decided result might be obtained.

ON ACROSIPHONIA TRAILLII, A NEW BRITISH ALGA. By
EDWARD A. L. BATTERS, B.A., LL.B., F.L.S.

(With Plate II.)

Acrosiphonia Trillii, J. G. Ag. (Batt. in Herb.).—Filaments slender, one or two inches long, tufted and densely matted at base, becoming free and divergent above; colour at first dark green, but soon becoming brownish olive; tufts composed of numerous separate bundles; branches near the base rhizoidal, recurved, and interlaced; upper branches erect, opposite, or subsecund; main axis distinct, composed of one or two long branches beset with opposite or scattered ramuli; the ultimate branches of two kinds, the one having apices drawn out with a long slender point, the other of nearly equal diameter throughout, with very obtuse apices. The spiny branches greatly outnumber the blunt ones, but both kinds are sometimes found side by side. Hooked branches are present, but in very small numbers. Fertile cells 1-2½ times as long as broad. Average width of filaments 110 μ .

Hab.—On rocks in shallow tide-pools, in the shade, at a little above half-tide level. March to July. Spores escape in June. Joppa, near Edinburgh. G. W. Traill.

This species belongs to the section *Speirogonicæ*, in which the fertile cells at first are scattered, solitary, or two or three together, of Kjellman's sub-genus *Melanarthrum*, which is characterised by the fertile cells containing very numerous motile bodies, about $2.5\ \mu$. in diameter, so closely packed as to render the cells which contain them opaque.

Although very closely related to *A. albescens*, Kjellm., *A. Traillii* appears to be a fairly well marked species.

Named in honour of Mr. G. W. Traill, its discoverer, to whom alone is due the credit of having noted that it was different from *A. centralis*.

EXPLANATION OF FIGURES IN PLATE II.

Fig. 1. Plant natural size.

Fig. 2. Portion of tuft separated, slightly magnified.

Fig. 3. Apex of a branch, showing spiny and blunt ramuli, $\times 100$.

Fig. 4. Branch with fertile cells, $f \times 100$.

Fig. 5. Branch with hooked ramulus and fertile cells, $\times 100$.

Fig. 6. Apex of obtuse ramulus, showing perforated chlorophyll body, $\times 100$.

Fig. 7. Base of branch with rhizoidal filaments, $\times 100$.

NOTES ON GLEICHENIAS. By PERCIVAL C. WAITE.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING MARCH 1894. By ROBERT LINDSAY, Curator.

During the month of March the thermometer was at or below the freezing point on nineteen mornings, indicating collectively for the month 63° of frost, as against 64° for the corresponding month last year. The lowest temperatures were registered on the mornings of the 12th, 27° ; 16th, 25° ; 17th, 24° ; 26th, 26° ; 27th, 25° . The day temperatures were high, the lowest being 46° , on the 5th, and the highest 65° , on the 30th. There was a fair amount of bright sunshine, and on the whole the month was a most favourable one. Vegetation generally has made good progress. The leaf-buds of deciduous trees and shrubs are well advanced. Early flowering varieties of *Rhododendron*, *Andromeda*, and *Ribes* are flowering freely.

Fig. 1.

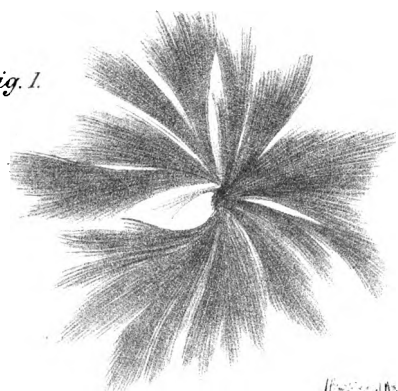


Fig. 3.

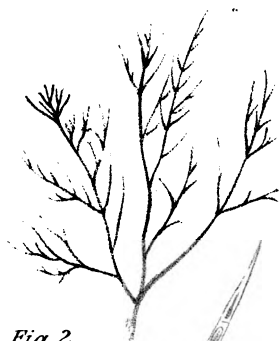
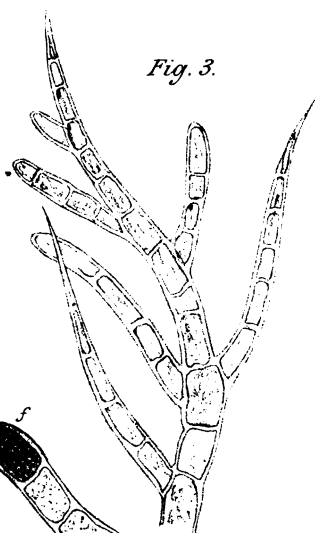


Fig. 2.

Fig. 7.

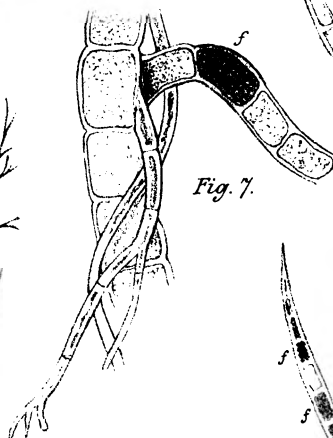


Fig. 5.

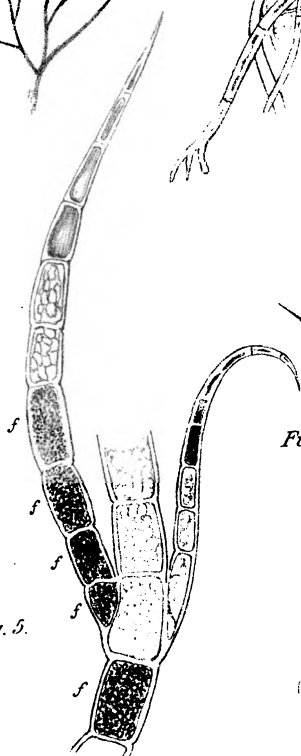
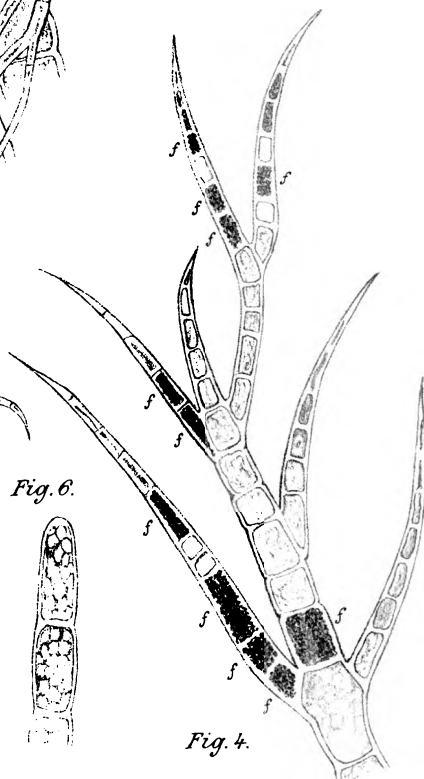


Fig. 6.



Fig. 4.



E Batters del.

F Huth, Lith^r Edin^r

ACROSIPHONIA TRAILLII, Batt.

Forsythia suspensa and *Magnolia conspicua* are unusually well flowered. Of the forty spring-flowering plants whose dates of flowering are annually recorded, the following eighteen came into flower during March, thus completing the list, viz.:—*Tussilago alba*, on 2nd March; *Narcissus pumilus*, 6th; *Scilla bifolia alba*, 6th; *S. taurica*, 6th; *Orobis vernus*, 6th; *Sisyrinchium grandiflorum album*, 12th; *Omphalodes verna*, 13th; *Draba aizoides*, 14th; *Erythronium Dens-canis*, 14th; *Aubrietia grandiflora*, 16th; *Sisyrinchium grandiflorum*, 18th; *Ribes sanguineum*, 19th; *Narcissus Pseudo-Narcissus*, 20th; *Corydalis solida*, 22nd; *Hyoscyamus Scopolia*, 22nd; *Symphytum caucasicum*, 22nd; *Adonis vernalis*, 24th; *Fritillaria imperialis*, 25th.

On the rock-garden 75 species and varieties came into flower during the month, as against 81 for March last year. Amongst the most interesting were—*Anemone ranunculoides*, *A. fulgens*, *Aubrietia Hendersonii*, *Cardamine trifoliata*, *Corydalis nobilis*, *Dentaria pentaphylla*, *D. enneaphylla*, *Doronicum caucasicum*, *Narcissus incomparabilis giganteus*, *Omphalodes verna alba*, *Pachysandra procumbens*, *Pachystima Canbyi*, *Rhododendron ciliatum*, *Saxifraga ciliata*, *S. juniperina*, *S. fimbriata*, *S. crassifolia*, *S. sancta*, *S. retusa*, *S. pyrenaica*, *Scopolia Hladnickiana*, *Soldanella montana*, etc.

Readings of exposed Thermometers at the Rock-Garden of the
Royal Botanic Garden, Edinburgh, during March 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	30°	40°	48°	17th	24°	50°	54°
2nd	32	43	49	18th	34	47	55
3rd	33	44	51	19th	43	48	57
4th	33	38	49	20th	44	47	51
5th	30	39	46	21st	37	54	61
6th	37	43	49	22nd	32	45	56
7th	27	33	52	23rd	29	43	58
8th	37	45	52	24th	32	44	57
9th	34	41	55	25th	27	42	56
10th	33	40	48	26th	26	43	48
11th	35	37	49	27th	25	38	56
12th	27	42	48	28th	34	44	53
13th	30	40	48	29th	28	40	62
14th	32	43	50	30th	30	39	65
15th	28	41	50	31st	31	40	57
16th	25	41	50				

REGISTER OF SPRING-FLOWERING PLANTS, SHOWING DATES
OF FLOWERING, AT THE ROYAL BOTANIC GARDEN,
EDINBURGH, DURING THE YEARS 1893 AND 1894.

No.	Names of Plants.	First Flowers opened.	
		1893.	1894.
1	<i>Adonis vernalis</i> ,	March 13	March 24
2	<i>Arabis albida</i> ,	" 3	February 20
3	<i>Aubrieta grandiflora</i> ,	" 20	March 16
4	<i>Bulbocodium vernalis</i> ,	February 10	January 12
5	<i>Corydalis solida</i> ,	March 24	March 22
6	<i>Coryllus Avellana</i> ,	February 8	February 3
7	<i>Crocus Susianus</i> ,	" 8	" 6
8	" <i>vernus</i> ,	" 14	" 12
9	<i>Daphne Mezereum</i> ,	" 19	" 19
10	<i>Dondia Epipactis</i> ,	January 16	Dec. 28 (1893)
11	<i>Draba aizoides</i> ,	March 13	March 14
12	<i>Eranthis hyemalis</i> ,	January 25	January 19
13	<i>Erythronium Dens-canis</i> ,	March 13	March 14
14	<i>Fritillaria imperialis</i> ,	April 3	" 25
15	<i>Galanthus nivalis</i> ,	January 30	January 16
16	" <i>plicatus</i> ,	" 28	" 22
17	<i>Hyoscyamus Scopolia</i> ,	March 18	March 22
18	<i>Iris reticulata</i> ,	" 3	February 19
19	<i>Leucojum vernalis</i> ,	February 6	January 18
20	<i>Mandragora officinalis</i> ,	March 26	February 26
21	<i>Narcissus Pseudo-Narcissus</i> ,	" 23	March 20
22	" <i>pumilus</i> ,	" 10	" 6
23	<i>Nordmannia cordifolia</i> ,	February 20	February 14
24	<i>Omphalodes verna</i> ,	March 15	March 13
25	<i>Orobis vernalis</i> ,	" 2	" 6
26	<i>Rhododendron atrovirens</i> ,	February 4	January 24
27	" <i>Nobleanum</i> ,	" 14	February 3
28	<i>Ribes sanguineum</i> ,	March 17	March 19
29	<i>Scilla bifolia</i> ,	" 6	February 5
30	" <i>alba</i> ,	" 7	March 6
31	" <i>præcox</i> ,	February 10	January 22
32	" <i>siberica</i> ,	" 14	" 22
33	" <i>taurica</i> ,	March 7	March 6
34	<i>Sisyrinchium grandiflorum</i> ,	" 2	" 18
35	" <i>album</i> ,	" 5	" 12
36	<i>Symphitum caucasicum</i> ,	" 24	" 22
37	<i>Symplocarpus foetidus</i> ,	February 14	February 13
38	<i>Tussilago alba</i> ,	" 16	March 2
39	" <i>fragrans</i> ,	" 6	Dec. 25 (1893)
40	" <i>nivea</i> ,	" 18	February 19

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF MARCH 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direc- tion.	
		Max.	Min.	Dry.	Wet.					
		°	°	°	°					
1	29-198	46·7	36·6	43·0	41·9	S. W.	Nim.	10	S. W.	0·340
2	29-428	47·0	35·8	42·0	40·1	W.	Cum.	6	W.	0·010
3	29-845	47·7	35·9	42·7	39·6	W.	...	0	...	0·060
4	29-538	51·4	35·5	39·9	38·8	W.	Cir. St.	8	W.	0·030
5	29-947	46·0	32·7	39·2	37·9	W.	Cir. St.	10	W.	0·140
6	29-153	46·4	39·0	43·8	41·1	W.	...	0	...	0·000
7	29-691	48·9	30·3	33·3	32·9	N. W.	Fog.	5	...	0·060
8	29-218	47·9	33·1	44·1	41·4	W.	Cir. St.	6	W.	0·035
9	29-142	48·6	37·3	43·1	41·1	S. W.	Nim.	10	S.	0·235
10	29-234	50·9	35·7	38·2	37·6	W.	Cir.	2	W.	0·330
11	28-883	48·8	37·8	41·2	38·8	W.	Cir. St.	5	W.	0·190
12	29-084	44·8	34·2	40·0	37·6	W.	...	0	...	0·000
13	28-786	45·8	33·2	37·8	36·2	W.	Cir.	1	W.	0·010
14	29-249	47·7	34·0	40·1	37·8	W.	...	0	...	0·020
15	29-376	46·8	34·1	37·8	36·8	N. W.	...	0	...	0·000
16	29-782	46·9	28·5	37·4	35·3	W.	...	0	...	0·000
17	30-089	48·0	28·1	42·4	39·8	W.	...	0	...	0·000
18	30-109	52·7	35·6	45·0	43·1	W.	Cum. St.	10	W.	0·000
19	30-181	51·7	44·6	50·1	48·7	W.	Cum. St.	10	W.	0·000
20	30-190	54·6	45·1	47·9	45·4	W.	Cum. St.	10	W.	0·000
21	30-164	49·6	39·6	49·6	46·0	W.	...	0	...	0·000
22	30-282	59·1	34·2	44·1	43·0	W.	Fog.	5	...	0·000
23	30-419	53·6	31·0	44·8	42·1	E.	Fog.	5	...	0·000
24	30-392	61·0	32·1	39·7	39·2	E.	Fog.	5	...	0·000
25	30-169	55·5	33·0	37·9	37·9	E.	Fog.	7	...	0·000
26	30-002	51·0	31·0	38·6	38·4	E.	Fog.	5	...	0·000
27	30-096	54·9	30·0	45·0	43·1	E.	Fog.	2	...	0·000
28	30-214	47·5	37·4	38·0	37·1	E.	St.	10	E.	0·010
29	30-061	46·0	31·0	40·5	40·3	E.	Cir.	3	N.	0·000
30	29-814	64·6	33·1	45·0	43·0	S. W.	Fog.	2	...	0·000
31	29-670	65·6	36·8	42·3	41·1	W.	Cum. St.	10	S.	0·010

Barometer.—Highest Observed, on the 23rd, = 30·419 inches. Lowest Observed, on the 13th, = 28·786 inches. Difference, or Monthly Range, = 1·633 inch. Mean = 29·723 inches.

S. R. Thermometers.—Highest Observed, on the 31st, = 65°·6. Lowest Observed, on the 17th, = 28°·1. Difference, or Monthly Range, = 37°·5. Mean of all the Highest = 50°·9. Mean of all the Lowest = 34°·7. Difference, or Mean Daily Range, = 16°·2. Mean Temperature of Month = 42°·8.

Hygrometer.—Mean of Dry Bulb = 41°·8. Mean of Wet Bulb = 40°·1.

Rainfall.—Number of Days on which Rain fell = 14. Amount of Fall = 1·480 inch. Greatest Fall in 24 hours, on the 1st, = 0·340 inch.

A. D. RICHARDSON,
Observer.

III. ON PLANTS IN THE PLANT HOUSES. By R. L. HARROW.

The past month, which is perhaps one of the most interesting periods of the whole year to those engaged in the study of plant life in its various stages, has been very favourable to the good development of both flowers and foliage. The great majority of plants cultivated under glass, which have been inactive during the winter, and have been partially or wholly destitute of foliage, are now vigorously started into growth. A much greater display of flowers has been produced, the number of species recorded being about seventy-five. A few of these we are able to exhibit, viz.:—

Brownea grandiceps, Jacq. This is a leguminous shrub, which is a native of South America, where it is said to attain a height of 60 feet. The inflorescences, which are produced in large globular heads at the extremity of branches, and also upon the old wood, resemble, when fully expanded, the flowers of a Rhododendron. The light red flowers at the base of the inflorescence are the first to open, the remainder opening successively in tiers until the apex is reached, and a fully expanded flower head is seen. The foliage, which is at all times handsome, has, in a young state, a peculiar drooping appearance, gradually with age assuming a more erect appearance. The leaves possess from nine to twelve pairs of leaflets. The figure in the "Botanical Magazine" was prepared from a specimen received from the Glasnevin, Botanic Garden, Dublin.

Myriocarpa longipes, Liebmann. This is a member of the order Urticaceæ, the genus consisting of six species. It is a strong-growing, shrub-like plant, with large elliptic leaves, some of which are about eighteen inches in length, and half the distance in breadth. The singular inflorescences are produced in the axils of the leaves, and branch dichotomously, sometimes attaining a length of from 2 to 3 feet, and trailing upon the ground. The flowers are arranged in a spiral manner along its whole length, giving it a remarkable appearance. It is a native of Vera Cruz. The plant under notice was received from Kew during 1893.

Randia maculata, DC. This plant was sent some years ago to this country by Mr. T. Whitfield, a noted collector of plants, from Sierra Leone, and was for some time known under the name of *Gardenia Stanleyana*. It is a free-flowering, shrub-like plant, with spreading dichotomous branching, the foliage being thick and oblong upon very short petioles. The flowers are produced singly in the forks of the branches, and when fully grown are about 9 inches long, being of a dull green and purple upon the outer surface, and white with purple blotches in the interior. The anthers are affixed to the inside of the mouth of the corolla. They are very fragrant, and a considerable time elapses from their first appearing till the corolla bursts; but when fully expanded the plant is a remarkably handsome object.

Strophanthus longicaudatus, DC. This genus of Apocynaceæ is noted for its poisonous properties, and has of late years supplied a drug used in connection with diseases of the heart. The species under notice is a native of Tropical Africa, and is a low-growing plant with opposite dark green leaves. The flowers are terminal, generally produced in threes. The sepals are small and persistent; the corolla is of a greenish-yellow colour. The five segments are reflexed and tail-like. It is now flowering in the annexe of the Palm House.

Fothergilla Gardenii, Murr. This is a pretty North American dwarf deciduous shrub, belonging to the order Hamamelideæ, this being the only species of the genus. The inflorescences are terminal, and appear before the leaves, the flowers, which are white, being very sweet scented. The foliage is small, the leaves being covered with lightish hairs.

Calypso borealis, Salisb. A North American terrestrial orchid of miniature growth. The flowers are of a pinkish colour, and borne upon a slender sheathed stem springing from the base of the petiole of the leaves. The labellum is larger than the petals and sepals, differing slightly in colour. The leaves are solitary, ovate, and of a succulent nature.

Of other plants of interest which have flowered may be noted: *Illicium anisatum*, Gærtn.,—the Star Anise of China,

bearing fragrant white flowers; *Hakea acicularis*, R. Br.,—a protead with acicular leaves and small white flowers, native of Australia; *Viburnum macrocephalum*, Fortune,—a beautiful spring-flowering shrub, with immense white inflorescences, from China; *Bowiea volubilis*, Harv.,—a liliaceous twining plant with small pedicillate flowers, a native of South Africa; *Bignonia speciosa*, R. Grah.,—a lovely tropical climber, from Uruguay; *Talauma pumila*, Blum.,—a native of Amboyna and Java, with deliciously scented flowers, only fragrant at night; *Rhododendron racemosum*, Franch.,—a small Yunnan species.

MEETING OF THE SOCIETY,

Thursday, May 10, 1894.

Dr. WILLIAM CRAIG, Vice-President, in the Chair.

Mr. R. TURNBULL exhibited a stem of *Hippuris*, showing a spiral arrangement of the normal whorls of leaves.

From Mr. P. H. NORMAND, Whitehill, Aberdour, were exhibited cut blooms of two-year-old seedlings of *Cytissus scoparium*, var. *andreanus*,—the flowers varied in colour, none so dark as the parent variety, and some being as yellow as the type; also blooms of *Spiræa primifolia*, fl. pl.; also a plant of *Anemone Hepatica*, with white blotches on the leaves; also cut blooms of double white Banksian rose from a cool conservatory at Balmuto; also blooms of *Ornithogalum lacteum*, grown under glass, which had been cut more than a month previous.

From Dr. STUART, Chirnside, cut blooms were exhibited of a *Trollius* hybrid between *T. europæus* and *T. americanus*.

From Mr. CAMPBELL of Ledaig cut blooms, from the open garden, were exhibited of *Deutzia gracilis*, *Buddleia globosa*, double red hawthorn, etc.

Amongst herbaceous and alpine plants on the table from the Royal Botanic Garden were—*Androsace sarmentosa*, *A. villosa*, *Daphne rupestris*, *Gentiana verna*, *Myosotis pygmæa*, *M. lithospermifolia*, *Silene acaulis alba*, *Sobolowskya clavata*.

The following papers were read:—

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING APRIL 1894. By ROBERT LINDSAY, Curator.

The past month of April has been one of the most favourable experienced for many years. Seldom has there been so little frost in April, and vegetation has gone on advancing without check. Such a fine early season rarely occurs. The foliage of many deciduous trees and shrubs is remarkably luxuriant and perfect. Apple, pear, cherry, and currants are quite smothered with blossom. Nearly all early ornamental trees and shrubs are flowering profusely—considerably above the average in this respect. The hawthorn came into flower on the 29th of the month, much earlier than I have ever observed it before, and fully three weeks before its ordinary time of flowering here. The thermometer was at or below the freezing point on six occasions, registering in all 5° of frost for the month, as against 12° for the corresponding month of last year. The lowest readings occurred on the 1st, 31°; 2nd, 29°; 14th, 32°; 20th, 32°; 21st, 31°. The lowest day temperature was 44° on the 3rd, and the highest 72° on the 27th of the month. The collective amount of frost registered this season up to the end of April is 325°, as against 517° for the same period last year. The following is the distribution for each month:—October, 18° of frost; November, 55°; December, 52°; January, 121°; February, 63°; March, 63°; April, 5°. The lowest point reached this season was 9° Fahr., or 23° of frost, which occurred on the 7th of January.

On the rock-garden 153 species and varieties came into flower during the month, as against 166 for April of last year. Among the more interesting were:—*Anemone alpina*, *A. Pulsatilla*, var. *bracteata*, *A. thalictroides*, *Androsace coronopifolia*, *Arnebia echinoides*, *Aubrietia Leichtlinii*, *Bryanthus erectus*, *Cassiope fastigiata*, *Crenularia eunomioides*, *Corydalis Scoulerii*, *Cytisus Arduinii*, *Erythronium giganteum*, *Heloniopsis umbellata*, *Muscari Szovitzianum*, *Narcissus*

Empress, *N. triandrus pulchellus*, *Phlox nivalis*, *P. setacea* vars., *Polemonium humile*, *Primula Dinyana*, *P. integrifolia*, *P. intermedia*, *Ranunculus montanus*, *R. speciosus*, *Rhodora canadensis*, *Rhododendron anthopogon*, *R. Chamæcistus*, *R. glaucum*, *R. Grievei*, *Sobolowskya clavata*, *Trillium erectum*, *T. grandiflorum*, *Uvularia grandiflora*, *Veronica linifolia*, etc.

Readings of exposed Thermometers at the Rock-Garden of the
Royal Botanic Garden, Edinburgh, during April 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum	9 A.M.	Maximum
1st	31°	45°	60°	16th	33°	46°	71°
2nd	29	41	59	17th	44	52	57
3rd	33	39	44	18th	41	43	53
4th	38	41	47	19th	35	49	58
5th	40	43	50	20th	32	52	61
6th	34	43	51	21st	31	50	61
7th	38	43	54	22nd	35	50	64
8th	38	42	50	23rd	38	48	52
9th	38	42	61	24th	38	46	60
10th	44	59	65	25th	36	50	65
11th	38	60	62	26th	40	50	68
12th	40	46	61	27th	32	50	72
13th	39	46	61	28th	36	51	71
14th	32	46	57	29th	42	57	65
15th	36	49	65	30th	44	50	57

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF APRIL 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direction.	
		Max.	Min.	Dry.	Wet.					
		°	°	°	°					
1	29-924	54-8	34-4	47-0	45-2	W.	Cum. St.	10	W.	0-120
2	29-879	57-9	32-1	42-9	42-4	S.E.	Cir. Cum.	3	S.E.	0-000
3	29-840	56-7	37-1	40-7	40-4	E.	St.	10	E.	0-010
4	30-040	42-2	40-4	42-1	41-0	E.	St.	10	E.	0-000
5	30-217	44-8	42-0	44-4	43-0	E.	St.	10	E.	0-005
6	30-165	51-0	39-8	42-7	41-2	E.	Cir. St.	10	E.	0-000
7	30-044	49-2	42-1	46-9	43-0	S.E.	Cir. St.	10	E.	0-140
8	29-877	49-5	41-1	42-3	41-4	E.	Cum. St.	10	E.	0-020
9	29-743	45-8	40-6	42-1	42-1	E.	Fog	10	...	0-010
10	29-887	56-9	41-5	56-8	51-6	W.	Cir.	5	W.	0-000
11	29-886	63-0	41-3	59-2	53-9	N.W.	Cir.	3	S.	0-000
12	29-762	61-8	44-0	46-9	45-5	E.	Cir.	6	E.	0-000
13	29-823	57-6	41-1	45-0	41-1	E.	Cum.	9	E.	0-000
14	29-631	48-6	36-7	44-7	41-0	E.	{ Cir. Cum. }	{ 4 } { 4 }	E.	0-000
15	29-588	51-9	39-4	49-1	46-0	S.	Cir.	2	S.	0-055
16	29-419	57-4	36-3	46-4	45-8	E.	Cir. St.	8	E.	0-300
17	29-289	54-5	43-8	45-9	45-7	S.	St.	10	S.	0-310
18	29-654	52-8	45-1	46-5	46-2	N.	Nim.	10	N.	0-350
19	30-072	49-6	37-5	48-9	45-9	E.	...	0	...	0-000
20	30-076	54-8	36-1	51-8	47-9	E.	...	0	...	0-000
21	29-959	58-5	35-1	47-4	45-0	E.	...	0	...	0-000
22	29-854	55-6	39-2	46-0	43-0	E.	...	0	...	0-030
23	29-593	56-9	41-9	45-3	43-9	E.	Cir.	8	E.	0-020
24	29-461	48-8	42-9	47-2	44-7	N.E.	{ Cir. Cum. }	{ 3 } { 6 }	{ S. } { E. }	{ 0-095 }
25	29-439	55-6	40-2	51-2	45-6	S.E.	Cum.	8	S.	0-000
26	29-495	58-8	43-5	49-7	45-0	S.	Cum.	9	S.	0-075
27	29-511	61-0	35-0	48-2	46-0	S.	Cir.	6	S.	0-000
28	29-904	56-0	40-9	52-2	47-0	N.	...	0	...	0-030
29	29-897	57-8	47-6	53-0	50-8	W.	Cir. St.	10	W.	0-100
30	30-160	60-6	47-0	50-2	47-9	S.	Cir. St.	10	N.	0-000

Barometer.—Highest Observed, on the 5th, = 30·217 inches. Lowest Observed, on the 17th, = 29·289 inches. Difference, or Monthly Range, = 0·928 inch. Mean = 29·803 inches.

S. R. Thermometers.—Highest Observed, on the 11th, = 63°·0. Lowest Observed, on the 2nd, = 32°·1. Difference, or Monthly Range, = 30°·9. Mean of all the Highest = 54°·3. Mean of all the Lowest = 40°·2. Difference, or Mean Daily Range, = 14°·1. Mean Temperature of Month = 47°·2.

Hygrometer.—Mean of Dry Bulb = 47°·4. Mean of Wet Bulb = 45°·0.

Rainfall.—Number of Days on which Rain fell = 16. Amount of Fall = 1·670 inch. Greatest Fall in 24 hours, on the 18th, = 0·350 inch.

A. D. RICHARDSON Observer.

III. ON PLANTS IN THE PLANT HOUSES, WITH EXHIBITION OF SPECIMENS. By R. L. HARROW.

The number of plants which have flowered in the houses of Royal Botanic Garden during the month of April is 125. This is a large increase upon the month of March, consequently there has been a much more showy appearance amongst the inhabitants of the greenhouses; the colours of the azaleas, rhododendrons, and other early summer flowering plants being especially brilliant. Amongst those worthy of notice are:—

Eugenia polypetala, Wight. This is an evergreen shrubby bush, a native of India, where it is said to grow to from twenty to thirty feet. The leaves are generally produced in whorls of three or four, are six to eight inches in length, and of a linear lanceolate shape, being borne on very short petioles. The flowers are large and solitary, arising upon the old wood. The number of petals is from twelve to sixteen. At present the plant is very rare in our gardens.

Utricularia montana, Jacq. A native of the West Indian Islands, this is probably the most handsome species of this genus of *Lentibulariæ*. The roots are swollen into hollow green tubers, connected by small fibres. The leaves are about six inches long, elliptic lanceolate, gradually becoming narrower as they near the petiole. The flowers are produced upon an erect scape, which rises above the foliage, generally bearing from three to four flowers; these are spurred and two-lipped, the lower lip being twice as large as the upper, and with a yellow blotch about the centre. The plant grows upon the damp mossy trunks of trees in its native habitats. A fine figure may be seen in the "Botanical Magazine," t. 5923.

Ranunculus cortusæfolius, Willd. This is a very showy species, which was introduced from Teneriffe in 1826, and is a tall-growing kind, the flowers being large and of a lustrous yellow, somewhat resembling the common buttercup. The foliage is dark green in colour, the radical leaves being large, gradually becoming smaller as the stem increases in height, all being covered with short hairs.

Richardia Rehmannii, N. E. Br. This is a lovely little Aroid, a native of South Africa, with narrow tapering leaves about eighteen inches long, arising from an underground rhizome. The inflorescence is small, and grows to a less length than the foliage. The spathe is white, slightly tinged with red at the margin.

Acradenia Franklinæ, Kipp. This plant is a member of the Rutaceæ, said to have been first introduced in 1845 from Tasmania. It is of a compact, shrubby growth. The leaves are trifoliate, fragrant, and covered with small glands. The flowers are white in terminal and axillary clusters, the petals deflexed, and stamens alternate.

Adenandra umbellata, Willd. Belonging also to the Rutaceæ, this is a native of the Cape of Good Hope, growing to a height of two or three feet. It is very free flowering, the flowers—three to four in number—being produced in an umbel-like manner at the apex of each shoot. The petals are large white, with a purple streak running through the centre of each. The leaves are small and alternate.

Amongst others of interest may be mentioned:—*Eutaxia myrtifolia*, R. Br.,—a pretty leguminous shrub, with numerous yellow and brown flowers, introduced in 1803 from Australia; *Cantua buxifolia*, Lamk.,—an elegant, slender, drooping polemoniaceous plant, introduced in 1849 from the Peruvian Andes, and figured in the "Botanical Magazine," t. 4582; *Hibbertia Readdi*, Hort.,—a small-growing plant, with small yellow flowers, belonging to the order Dilleniaceæ; *Malpighia coccifera*, Linn.,—possesses small, solitary, pink flowers and spiny leaves, growing to a height of about three feet; *Armeria latifolia*, Willd.,—this pretty species was lately figured in the "Botanical Magazine," from a plant flowered at Kew, received from these gardens; *Marica Northiana*, Ker.,—a fragrant species from Brazil, with livid, showy flowers; *Oncidium altissimum*, Smith,—introduced nearly a century ago from the West Indies, bears scapes, sometimes 3 feet in length, carrying numerous yellow flowers; *Tetranema mexicana*, Benth.,—commonly called the Mexican Foxglove, a small-growing plant, with short peduncles, the flowers lasting over a long period; *Phalenopsis Luddemania*, Rchb. fil.,—a native of the Philippines, introduced by Messrs. Hugh Low & Co.

MEETING OF THE SOCIETY,

Thursday, June 14, 1894.

Professor BOWER, President, in the Chair.

Mr. WILLIAM SANDERSON exhibited a plant of *Oncidium macranthum* in flower.

From Mr. CAMPBELL of Ledaig was exhibited a shell-full of ripe strawberries from his open garden.

. Amongst herbaceous plants from the Royal Botanic Garden on the table were a series of hybrids of *Dianthus*, raised by Mr. BURNETT, of Aberdeen.

Mr. TAGG exhibited specimens of *Tabernæmontana longiflora*, Benth., showing extra-axillary branching.

The following papers were read :—

NOTE ON THE OCCURRENCE OF A VARIEGATED FORM OF THE COMMON MISTLETOE (*Viscum album*). By J. GRIEVE.

There is at present growing on a healthy thorn, in the Dean Cemetery of this city, a form of the common mistletoe sufficiently striking to merit attention being called to it. As will be seen from the specimen exhibited, the leaves are beautifully variegated, such a departure from the normal type being very unusual. Indeed, I do not know of any other example of the mistletoe "sporting" in this manner, and I have ventured to place it before the Society in order to learn if any of the members have met with such "sports" in this parasitic plant. The specimen exhibited is some ten or twelve years old, but no record of it has hitherto been made.

Issued November 1894.

Mr. DUNN remarked that he had seen variegated specimens of mistletoe, but only on unhealthy hosts.

NOTE ON THE ORIGIN AND HISTORY OF *SAXIFRAGA WALLACEI*, HORT. By J. GRIEVE.

As I am aware that the Botanical Society of Edinburgh does not confine its attention to matters of purely scientific botany, but takes a great interest in everything relating to horticulture also, I need scarcely apologise for bringing under your notice the subject of the origin and history of a now well-known plant, namely, *Saxifraga Wallacei*. I am the more anxious to place this subject before you, seeing that doubts still exist in the minds of many—both as to the parentage of the plant and its raiser*; and being acquainted with its history from the beginning, I am able to speak with some degree of confidence on the subject.

In 1873, Messrs. Jas. Backhouse & Son, of York, sent out

* Under *S. Camposii*, Boiss. et Reut., in the "Botanical Magazine," t. 6640, which had been in cultivation for many years at Kew, Mr. Baker places as a synonym *S. Wallacei*, Hort., and says:—"According to Willkinson, its [*S. Camposii*] nearest affinity is with *S. trifurcata*, Schrad. ('Botanical Magazine,' t. 1651), and *S. cuneata*, Willd., but to me it appears to be scarcely distinguishable from *S. Maweana*, Baker ('Botanical Magazine,' t. 6384), except in the smaller leaves, which seem never to assume the reniform shape. It is true that, judging by the dried native specimens, *S. Camposii* is a stouter, more rigid species, with a more crowded rosette of leaves, and shorter peduncles and pedicels, but under cultivation these differences are so considerably modified that the two plants may not unreasonably be regarded as geographical forms, one inhabiting the southern mountains of Spain, the other the northernmost ones of Morocco. The *S. maderensis* represents the same type in its western limit of growth—the island of Madeira; the *S. cuneata* of the Pyrenees represents the northern limit within the Peninsular area; within that area occur the equally or, indeed, more closely connected forms of *S. obscura*, Gren. and Godr., and *S. canaliculata*, Boiss. et Reut.; and it would not be difficult to connect all with the forms that occur under other names elsewhere in Western Europe." This is interesting taken in connection with the following dogmatic assertion of a writer in the "Garden," xxxv. (1889), p. 420:—"S. *Wallacei*, however it may have found its way to the Dean Cemetery, is *S. Camposii*, Boiss., cultivated for many years in gardens, and having nothing to do with *S. Maweana*." As illustrating the confusion that exists regarding these dactyloid saxifragas, the following quotation from another writer in the "Garden," xxix. (1891), p. 545, may be noted:—"True *S. Camposii* of Boissier is very seldom met with in cultivation, and I question whether it is to be found growing in any garden except that of M. Boissier himself, or of some one to whom he may have given a specimen of the plant."

two new Saxifrages—*S. Maweana* * and *S. Wilkommiana*.† These were described by them as “two new species of the *S. palmata* section, with showy tufts of large pure white flowers, on stems six to ten inches high.” They added that, though nearly allied to each other, they are quite distinct, and might be regarded as two of the finest of the group. The first of these, *S. Maweana*, has now practically gone out of cultivation; but the second, *S. Wilkommiana*, is still grown.

Some two years after they were sent out, the late George Wallace, of the Dean Cemetery, Edinburgh, succeeded in raising from them a saxifrage now usually known in plant catalogues as *S. Wallacei* of gardens. This plant has become very widely known, and it is, perhaps, one of the best of its kind, whether for bedding purposes or as a pot plant. It has some qualities which mark it as an improvement on both parents, since it lasts longer in bloom than *S. Maweana*, and is of much superior habit to *S. Wilkommiana*, while it possesses a sweet scent but faintly present in either parent. Messrs. Dicksons & Co. procured the original plant from the raiser, and at once proceeded to increase it, preparatory to sending it out.‡ As many as 10,000 pots of it have been in stock in Messrs. Dicksons’ Nurseries at one time—for, although the plant very rarely seeds, it is easily grown from cuttings. It was distributed all over Britain and throughout the Continent of Europe, as well as in America.

As already stated, doubts have been thrown on its origin and history, and it is chiefly to set these doubts at rest, and to give honour to whom honour is due in the raising of it, that I have ventured to bring this subject to-night before

* *S. Maweana*, Baker, figured in the “Botanical Magazine,” t. 6384, was discovered by Mr. P. B. Webb, of Paris, in 1827, “in its only known habitat, rocks of the Beni Hosmar range of mountains opposite Tetuan,” in Morocco, “at about 2000 feet elevation.” He regarded it as a form of *S. globulifera*. It was not recognised to be a new species until Mr. Maw gathered it in 1869, and it was introduced into cultivation by him. It is also figured in “Gardeners’ Chronicle,” 1871, fig. 300.

† Is the *S. canaliculata*, Boiss. et Reut., from the mountains of Spain?

‡ It was awarded a first-class certificate by the Royal Caledonian Horticultural Society in 1878. The name was given at the suggestion of Mr. James M’Nab.

the members of the Botanical Society. I trust the plant will long keep alive the memory of its raiser—one who, though but a humble horticulturist, was, throughout a long life, a keen and enthusiastic lover of plants.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING MAY 1894. By ROBERT LINDSAY, Curator.

The past month of May will be remembered as one of the most disastrous to vegetation that has occurred for many years. Preceded by a very mild and genial month, vegetation was in a most forward and flourishing condition, rendering it peculiarly susceptible to injury from frost. Between the 19th and the 24th of the month a succession of frosty nights took place, which has done serious damage to fruit crops throughout the country. Many hardy trees, shrubs, and herbaceous plants have sustained severe injury. The following plants, in exposed situations, were more or less injured:—*Azalea pontica*, *A. mollis*, and Ghent varieties Laburnum and Horse Chesnut, had their flowers browned and destroyed; young shoots of Oak, Ash, Maple, Larch, *Abies Veitchii*, and *A. cephalonica*, Roses, *Dimorphanthus*, Rhododendrons of the Arboreum and Campanulatum breeds, *Pieris formosa*, Tulip tree, etc.; *Spiræa palmata*, *S. Aruncus*, *Rodgersia podophylla*, *Rheum officinale*, and *R. Emodi*, *Tamus communis*, *Polygonum Sieboldii*, *P. amplexicaule*, *P. molle*, *Trillium grandiflorum*, Male Fern, Oak Fern, Royal Fern, and even the Common Bracken had their young fronds completely blackened. The thermometer was below the freezing point on six occasions, registering in all 23° of frost. The lowest readings occurred on the 20th, 28°; 21st, 26°; 22nd, 28°; 23rd, 28°; 24th, 28°. The lowest day temperature was 48°, on the 16th, and the highest 70°, on the 4th of the month.

On the rock-garden 227 species and varieties came into blossom against 300 for May of last year. Among the most interesting were:—*Anemone narcissiflora*, *A. Polyanthus*, *Aciphylla Colensoi*, *Anthemis alpestris*, *Androsace sarmentosa*, *A. lactea*, *Anthyllis erinacea*, *Aquilegia Whitmanniana*,

Cheiranthus alpinus, *C. Allionii*, *Cytisus decumbens*, *C. Scoparius Andreanus*, *C. purpureus*, *Campanula Allionii*, *Clintonia Andrewsiana*, *Daphne Cneorum*, *D. Fioniana*, *Dodecatheon integrifolium*, *Doronicum grandiflorum*, *Dianthus Michael Foster*, *Enkianthus himalaiensis*, *Gentiana verna*, *Linum flavum*, *Myosotis alpestris*, *Mertensia sibirica*, *Menziesia Drummondii*, *Onosma taurica*, *Ononis rotundifolia*, *Olearia Gunniana*, *Phlox verna*, *Primula integrifolia*, *P. magellanica*, *P. rosea*, *P. sikkimensis*, *Potentilla aurea*, *Papaver pyrenaicum*, *Rubus arcticus*, *Ranunculus Traunfelnerii*, *Ramondia pyrenaica alba*, *Saxifraga atropurpurea*, *S. Melvillei*, *S. Sturmiiana*, *Saponaria ocymoides Loderi*, *Silene acaulis*, *Scilla peruviana*, *Veronica saxatilis alba*, *Wulfenia carinthiaca*, etc.

Readings of exposed Thermometers at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during May 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	37°	49°	59°	17th	39°	44°	53°
2nd	38	45	55	18th	41	48	55
3rd	42	50	52	19th	37	42	49
4th	33	43	70	20th	28	37	58
5th	31	54	58	21st	26	47	50
6th	39	54	63	22nd	27	44	57
7th	38	46	53	23rd	28	50	58
8th	39	46	63	24th	28	56	67
9th	39	50	61	25th	37	55	69
10th	39	54	65	26th	38	47	53
11th	41	55	63	27th	36	45	59
12th	37	61	64	28th	37	43	52
13th	35	50	60	29th	39	42	56
14th	41	44	53	30th	39	41	57
15th	43	45	50	31st	40	59	61
16th	42	43	48				

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF MAY 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direc- tion.	
		Max.	Min.	Dry.	Wet.					
1	30·319	59·4	40·6	51·2	46·9	N.W.	Cir. St.	10	N.	0·215
2	29·957	58·5	40·7	47·1	46·9	W.	Nim.	10	W.	0·135
3	29·584	54·8	44·7	54·1	49·8	N.W.	Cir.	5	N.W.	0·005
4	29·640	56·9	35·6	43·3	38·3	N.W.	Cum.	6	N.W.	0·000
5	29·825	52·1	35·0	50·1	44·0	N.W.	...	0	...	0·050
6	29·449	55·9	42·2	52·1	47·9	W.	{ Cir. Cum. }	{ 2 4 }	W.	0·060
7	29·489	57·7	40·6	49·0	45·8	W.	Cum. St.	10	W.	0·185
8	29·653	56·5	41·8	48·2	48·0	S.	Nim.	10	S.	0·040
9	29·564	58·6	42·0	51·6	46·9	S.	Cum. St.	10	S.	0·010
10	29·370	55·0	42·7	51·4	47·0	S.	{ Cir. Cum. St. }	{ 4 5 }	S.	0·165
11	29·607	60·8	42·7	51·4	47·2	W.	Cum. St.	10	W.	0·000
12	29·902	60·7	39·6	56·7	50·8	N.W.	Cum.	1	N.W.	0·000
13	30·018	60·0	38·0	49·7	45·0	S.E.	Cum. St.	9	S.E.	0·405
14	29·854	54·6	44·0	45·7	45·4	E.	Nim.	10	E.	0·480
15	29·977	49·8	45·7	47·1	47·0	E.	Nim.	10	E.	0·110
16	30·131	48·2	44·8	45·1	44·3	E.	Nim.	10	E.	0·045
17	30·340	46·6	42·6	44·4	42·3	E.	Cum. St.	10	E.	0·000
18	30·321	47·8	44·0	47·2	44·1	E.	Cir.	8	N.W.	0·015
19	30·321	51·4	40·5	43·0	37·7	N.E.	Cum. St.	10	N.E.	0·000
20	29·986	44·7	32·1	40·9	37·0	Var.	Cum. St.	10	N.E.	0·020
21	29·958	50·1	31·7	44·4	39·2	N.E.	Cum.	2	N.	0·020
22	30·081	50·2	31·9	47·6	43·0	N.E.	Cum.	1	N.W.	0·020
23	30·335	51·8	32·2	48·2	42·7	N.E.	...	0	...	0·020
24	30·411	53·2	33·2	48·7	45·1	N.E.	...	0	...	0·020
25	30·098	59·7	43·1	54·8	48·1	W.	Cir. St.	9	N.W.	0·015
26	29·933	63·1	41·9	47·7	43·9	N.	Cum. St.	9	N.	0·030
27	29·810	50·4	39·8	46·9	40·7	N.	Cum.	5	N.	0·200
28	29·533	53·8	42·0	45·4	44·1	N.E.	Nim.	10	N.E.	0·240
29	29·565	48·3	43·0	48·2	44·9	E.	Cum. St.	8	E.	0·250
30	29·605	52·1	42·9	45·9	44·7	E.	Nim.	10	E.	0·090
31	29·611	51·3	43·0	46·9	45·1	N.	Cum. St.	10	N.	0·010

Barometer.—Highest Observed, on the 24th, = 30·411 inches. Lowest Observed, on the 10th, = 29·370 inches. Difference, or Monthly Range, = 1·041 inch. Mean = 29·879 inches.

S. R. Thermometers.—Highest Observed, on the 26th, = 63°·1. Lowest Observed, on the 21st, = 31°·7. Difference, or Monthly Range, = 31°·4. Mean of all the Highest = 54°·0. Mean of all the Lowest = 40°·1. Difference, or Mean Daily Range, = 13°·9. Mean Temperature of Month = 47°·0.

Hygrometer.—Mean of Dry Bulb = 48°·2. Mean of Wet Bulb = 44°·6.

Rainfall.—Number of Days on which Rain fell = 26. Amount of Fall = 2·805 inches. Greatest Fall in 24 hours, on the 14th, = 0·480 inch.

A. D. RICHARDSON,
Observer.

III. ON PLANTS IN THE PLANT HOUSES. BY R. L. HARROW.

During the month of May many interesting and rare plants have flowered in the houses of the Royal Botanic Garden. The luxuriant well-ripened growth of last summer has already shown very satisfactory results, in copious floriferousness. Several plants have, since the last meeting of the Society, produced their flowers in profusion, due, no doubt, to the greater amount of light and better conditions under which they are now grown, this being particularly noticeable in the Palm House. The number of species flowered during the past month numbers rather more than one hundred and twenty-five. Among the most noteworthy are the following:—

Odontodenia speciosa, Benth. This is a climbing plant, a native of Trinidad, said to have been first flowered in Europe by Messrs. Veitch in 1854. The strong-growing stems of this plant are glabrous and terete, the large opposite leaves being of leathery substance, borne upon short stout petioles. Its inflorescences of terminal and axillary racemes are very handsome, the individual flowers measure about three inches across the corolla, and are reddish-yellow in colour. A figure of this plant may be seen in the "Botanical Magazine," t. 4825, under the name of *Dipladenia Harrisii*.

Sandersonia aurantiaca, Hook. A rare plant in cultivation; discovered at Durban, South Africa, in 1854, by Mr. J. Sanderson, Secretary of the Hort. Society of Natal, after whom this monotypic genus was named. The herbaceous stems resemble in manner of growth those of *Gloriosa*, and grow to about three feet in height. The lower leaves are larger and more distant than those nearer the apex, from the axils of which the solitary flowers spring. These are drooping; the orange-coloured perianth being inflated, the throat contracted, and the limb six-toothed; at the base of the perianth are six spurs containing nectar.

Prostranthera lasianthos, Labill. This native of New South Wales has long been an inmate of our gardens, having been introduced in 1806, yet it is but seldom seen in cultivation. It has a shrub-like habit, with lanceolate

serrated leaves of a dark green colour. The flowers are axillary and terminal, with bilabiate corolla, which is very hairy, the throat covered with lavender coloured spots.

Reevesia thyrsoides, Lindl. This tree-like shrub, a member of the order Sterculiaceæ, is a native of China. It was flowered at Kew in 1845, having previously been introduced by J. Reeves, Esq., of Canton. The foliage is of a dark green colour, the individual leaves are broadly lanceolate acuminate. The inflorescences are in large terminal corymbs, and very fragrant. The petals are pure white, the filaments of the anthers united into a tube, the stigma protruding above at the apex.

Eurycles sylvestris, Salisb. The pretty white flowers of this now rare species of Amaryllid are now to be seen in the Palm House. They are large and pure white, borne upon a stout peduncle in a umbel-like manner. The leaves are broad and fleshy, the venation being very prominent, are about a foot high, and are produced after the appearance of the inflorescence. Its native habitats are the Malay Peninsula and Phillipines.

Aotus gracillima, Meissn. Amongst Australian Leguminosæ this takes a high rank as a decorative plant. The slender branches grow to a length of about three feet; the linear leaves are scattered and numerous. The flowers are borne in profusion for about a foot at the ends of the branches, and are of a yellow and brown colour.

Cyrtanthus Huttonii, Baker. This rare species is one of the most lovely of the cultivated plants of this genus, and has lately produced a strong inflorescence. The leaves are about a foot long, the stout peduncle springing from amongst them, and the flowers produced in an umbel-like manner. The perianth is of a reddish-yellow colour, about an inch in length. A native of Cape Colony.

Others of interest are:—*Platytheca galioides*, Steetz,—a monotypic genus of Tremandreae. This species has an erect habit, small linear leaves, and numerous pretty blue flowers; a native of South-west Australia. *Elæocarpus cyaneus*, Sims,—an Australian plant with racemes of white flowers, the fruits being blue; *Passiflora alata*, Aiton,—a large flowered species with crimson and purple flowers, a native of Peru, introduced in 1772; *Darwinia Hookeriana*,

Benth.,—possessing pretty drooping flowers, belonging to the order Myrtaceæ, a native of Australia; *Phajus Marshalliæ*,—a fast-growing, white-flowered orchid from Moulmein; *Burchellia capensis*, R. Br.,—an evergreen shrub with scarlet heads of flowers, belonging to the order Rubiaceæ; *Goethea Wiotii*, Hort.,—a tropical member of Malvaceæ, with peculiar flowers possessing an epicalyx; *Gesnera elongata*, Humb. et Bonpl.

MEETING OF THE SOCIETY,

Thursday, July 12, 1894.

Dr. WILLIAM CRAIG, Vice-President, in the Chair.

Miss KATHERINE MILLAR and Mr. ALEXANDER PORTEOUS were elected Resident Fellows of the Society.

Dr. T. B. SPRAGUE exhibited specimens of peloria in *Digitalis purpurea* and in *Campanula*.

Miss MADDEN exhibited a specimen of peloria in *Digitalis purpurea*.

Mr. R. TURNBULL exhibited a leaf of cabbage showing hypertrophic development of the midrib.

Mr. DUNN exhibited *Morus alba*, with set fruit, from the open garden at Dalkeith.

Mr. J. GRIEVE exhibited a plant with flowers, in pot, of *Rubus phœnicolasius*, the Japanese wine-berry, one of the so-called American blackberries.

Amongst herbaceous plants on the table from the Royal Botanic Garden were: *Primula involucrata*, *Allium M'Nabianum*, *Pratia angulata*, etc.

The following papers were read :—

REPORT ON THE FLORA OF ROUND ISLAND, MAURITIUS.
By Surgeon-Major H. H. JOHNSTON, Army Medical Staff,
D.Sc., F.L.S.

The islands forming the Mauritius group are situated in the Southern Indian Ocean, in 20° south latitude and between 57° and 58° east longitude. They lie 470 miles east of Madagascar, and 100 miles east-by-north of

Issued November 1894.

Bourbon. The principal island of the group, to which the name Mauritius is applied, is a mountainous oceanic island of volcanic origin, but no active volcano has been known within the memory of man. The geological formation consists of vesicular basalt, which, on decomposing, forms a very porous red earth.

The island has an area of 713 square miles, its greatest length from north to south being 38 miles, and its breadth from east to west 28 miles.

The northern part of the island is a low plain, and the centre consists of an elevated plateau surrounded by three ranges of rugged mountains, reaching a height of 2711 feet above sea-level in the Black River Mountain.

There are numerous streams of water, the largest of which is twelve miles long. The lakes are few in number and small in size.

When Mauritius was discovered by the Portuguese in 1505, the island was clothed to the water's edge with virgin forest, in which existed a large number of endemic species of plants. On account of the terrific hurricanes which occasionally visit the island, the trees were nowhere high, but they formed a dense mass of nearly uniform height, and they were thus better fitted to withstand the violence of the wind. Beneath this dense canopy of ever-green foliage, large numbers of shade and moisture-loving plants, such as orchids, ferns, club-mosses, and other Cryptogams, found a genial home. During the present century the greater part of the virgin forest has been cleared away to make room for sugar-cane plantations, in consequence of which many of the native plants have been exterminated. Foreign plants have found their way into the island, where they flourish, and have killed out many of the native species. Thus, in Baker's "Flora of Mauritius and the Seychelles," published in 1877, the number of native flowering plants is only 705 species, whereas the naturalised species number 269.

Mauritius, being situated within three degrees of the Tropic of Capricorn, has a tropical climate; but owing to its isolated position in the Indian Ocean and the cool south-east trade wind which blows during the greater part of the year, the climate is more temperate than that of

other places in the same latitude. In general terms the climate may be described as hot, damp, and rainy, with a fair amount of bright sunshine, moderate winds, and occasional hurricanes of terrific violence. The higher parts of the island are much cooler, but very much damper and more rainy than at the coast. From observations made at the Royal Alfred Observatory, situated at Pamplemousses, and 179 feet above sea-level, I am enabled to give the following particulars of the climate of Mauritius near the coast. Mean atmospheric pressure, reduced to sea-level, 30·082 inches; lowest, 27·95 inches in the great hurricane of 29th April 1892, when the wind reached a velocity of 121 miles per hour. The mean velocity of the wind is only 11·4 miles per hour, and storms and gales very seldom occur. During the thirteen years 1876–88 the wind exceeded 40 miles per hour on three occasions only. The mean temperature in the shade is 74°·8 F., highest 96°·2 F., and lowest 48° F. The mean annual rainfall is 47·02 inches, but the quantity varies considerably in different years, and it has ranged from 29·74 inches to 71·86 inches. The average number of days of rainfall is 200. The relative humidity of the atmosphere is 73·7 per cent. of saturation, the highest recorded on any one day was 97 per cent., and the lowest 38·4 per cent. In 1888 the total duration of bright sunshine was 62 per cent. of the possible bright sunshine, or, in other words, the sun was not obscured by clouds during 62 per cent. of the time it was above the horizon.

Mauritius is almost encircled by a coral reef, which in some places extends two or three miles out from the shore. From one to one and a half mile beyond the outer margin of this reef the 100-fathom line of soundings is reached, except at the north end of the island; where a shallow sea extends 15 miles to the north. The sea over the greater part of this northern bank is under 30 fathoms deep, and on the bank there are numerous shoals and reefs, besides a few small islands of volcanic formation. The most distant of these islands are Round Island and Serpent Island. The former is situated 13 miles north-east of the north end of Mauritius, and the latter lies 1½ mile north of Round Island. Beyond the 100-fathom

line the sea becomes rapidly deeper, and at a distance of only 8 miles from the coast of Mauritius the depth is 1350 fathoms, and at 20 miles 1870 fathoms, or 11,220 feet. It will, therefore, be observed that the islands of the Mauritius group form the summit of a huge volcanic mountain, the greater part of which is submerged beneath the waters of the Indian Ocean. Round Island, though only 13 miles distant from Mauritius, and separated from it by a shallow sea nowhere exceeding 43 fathoms, contains several species of endemic plants and animals, which are not found on Mauritius itself. If these two islands were ever connected together by dry land, it must have been at a very remote period, before such differences could have occurred in their floras and faunas. How much more remote then must have been the time when such islands as Mauritius, Bourbon, and Rodriguez were supposed to have formed part of an ancient continent, when these islands are now separated by an ocean over 11,000 feet deep. The floras and faunas of the Mascaren Islands are of the same type, and the different islands, besides containing their own peculiar endemic species, also contain species common to the other islands of the group, as well as several species widely distributed over other parts of the world.

Round Island is not surrounded by a coral reef; and in consequence of its exposed position to the surf, caused by the prevailing south-east trade wind, it is only possible to land on the island after a spell of calm weather. Even then a landing is only possible at two points, one on the west and the other on the south-west side of the island.

Lieutenant-Colonel J. A. Lloyd, Surveyor-General of Mauritius, visited Round Island on 16th December 1844, and was storm-stayed for seven days. His attention was chiefly directed to the geology of the island; and an account of his visit is published in the "Transactions of the Natural History Society of Mauritius" for the years 1842-45, pp. 154-161. He also visited Serpent Island, the most remote of the Mauritius group. Colonel Lloyd only refers to the flora and fauna in a general way, and the paper published by him deals chiefly with the geology of the island.

Colonel N. Pike, author of "Sub-Tropical Rambles," paid a visit to Round Island on 7th December 1868, and investigated its fauna. He again visited the island, on 10th November 1869, in company with the Governor, Sir H. Barkly, and Mr. John Horne, Director of Woods and Forests. Colonel Pike devoted his attention to the fauna, and Sir H. Barkly and Mr. Horne investigated the flora. Accounts of the scientific results of these two visits are given by Colonel Pike in his "Sub-Tropical Rambles," published in 1873, and in the "Transactions of the Royal Society of Arts and Sciences of Mauritius" for 1869.

On 26th November 1889, after a long spell of calm dry weather, Mr. William Scott, Assistant Director of Woods and Forests, and I landed on Round Island and resided on it for two days, with no other protection from the weather than that afforded by the fan-shaped leaves of a palm tree. As Round Island is uninhabited, and contains no drinking water in dry weather, one has to bring everything in the way of food and drink from Mauritius, and it is especially necessary to bring a large supply of provisions in case of being storm-stayed, as happened to Colonels Lloyd and Pike.

Having made arrangements beforehand to have a boat ready for us at Mapou, at the north end of Mauritius, Mr. Scott and I started from the Royal Botanic Garden at Pamplemousses, at three o'clock in the morning of 26th November 1889. Mr. Scott and I drove together, and we were followed by two carioles conveying our two Indian servants, provisions, water-barrel, camp-bed, botanical apparatus, etc. After a drive of eleven miles we reached Mapou at five o'clock, at which hour we had ordered the boat to be ready; but, with the usual unpunctuality of natives in out of the way places, it was seven o'clock before we set sail for Round Island. After a short sail over the smooth shallow sea intervening between the land and the outer margin of the coral reef, we steered through a narrow channel in the reef, locally called a "passe," and soon found ourselves being tossed about by the long swell of the Indian Ocean. The morning was fine, bright, and dry, but, unfortunately, we had a light wind which was considerably ahead of us, and during the six hours

occupied in crossing we suffered considerably from the effects of sea-sickness.

As we neared our destination and came into smoother water in the lee of the west side of the island, we were enabled to have occasional glimpses over the gunwale of the boat, and note the general appearance of the island. As the name implies, the general outline of Round Island is that of a rounded dome rising abruptly out of the ocean and reaching an elevation of 1055 feet above sea-level. The island is 1 mile long from north to south, and $\frac{3}{4}$ mile broad from east to west. From a distance the island has a very barren aspect, its steep, brown, rocky sides having only small clusters and scattered plants of palms and screw-pines to enliven the desert appearance of the island. In this respect it forms a marked contrast to the luxuriant evergreen forests of Mauritius. The tree-flora appeared to be entirely composed of palms and screw-pines, and, in this respect also, it differed entirely from the native forests of Mauritius and other tropical countries I have visited, where the great bulk of the trees belong to the Dicotyledons, and palms stand out only here and there, giving the landscape its well-known tropical appearance.

At about one o'clock in the afternoon our boat approached the landing-place on the west side of the island. There was very little swell on at the time, but we had to exercise caution in landing on account of the exposed position of the coast, which is unprotected by any natural barrier. There is no beach, and the shelving cliffs rise out of water about two fathoms deep. As we neared the landing-place, which is formed of a flattish portion of rock 5 feet above the surface of the sea, one of the boatmen dropped a heavy stone attached to a rope over the stern of the boat, and allowed the stone to reach the bottom of the sea. Then by means of the rope he allowed the boat to drift towards the landing-place, until the bow of the boat was sufficiently near the rock to allow another boatman to jump on shore, and pass another rope, attached to the bow of the boat, through an iron ring fastened in the rock. By these means the bow of the boat was steadied within about a foot of the landing-rock, and watching our opportunity, as the boat rose and fell with the swell, we jumped on shore

at the proper moment; and immediately afterwards we had all our stores landed and carried to the top of the rocky shelving cliffs, where they were deposited under the shade of some palm trees. The boat returned to Mapou the same afternoon, and we were left to our own resources on the island for the next two days.

Feeling the effects of sea-sickness, I confined myself to botanising in the immediate vicinity of our camp on the afternoon of our arrival on the island. On the following day I botanised during the greater part of the day, and ascended to the top of the hill, from which I obtained a good view of Serpent Island, which rises out of the sea like a haystack to the height of 530 feet. It lies $1\frac{1}{2}$ mile to the north of Round Island, and it is about $\frac{1}{3}$ mile broad. The steep sides of Serpent Island are almost destitute of vegetation, and they have a white chalky appearance from the guano which has been washed down over them by the rain. Colonel Lloyd landed on Serpent Island in 1844, and he states that the three species of sea-birds he observed on it were different from the three species of sea-birds found on Round Island. On the forenoon of our last day on Round Island, I collected specimens of the three species of palms which are native on the island. The boat returned for us on 28th November, and at about three o'clock in the afternoon we set sail with a fair wind for Mapou, which we reached in about three hours' time, and drove the same evening to Pamplemousses.

Mr. Scott devoted his time to making collections of specimens of the rocks and animals; and he also shot a couple of rabbits, which have been introduced into the island. With reference to the geological formation, Round Island appears to have once formed part of a volcanic crater, as described by Darwin in the case of the Galapagos Islands. The eastern side of the island has a crescentic shape, and it is much steeper than the western side. The rocks also on the eastern side appeared to me to have been exposed to much greater heat than those of other parts of the island. From these circumstances the island appears to have been originally a volcanic crater, in which, subsequently, the continued action of the surf, caused by the prevailing south-east trade wind, has gradually worn away

the soft friable volcanic tuff of the eastern half of the crater. The greater part of Round Island is formed of this volcanic tuff, which abounds in olivine, and occurs in well marked strata. On the western side of the island I observed that the strata dipped towards the west at an angle of about 35 degrees. In many places there were narrow fissures running east and west, and other fissures at right angles to these. The greater part of the surface of the island is composed of bare rocks of volcanic tuff, from which almost all the soil has been washed away by the heavy rains into the sea. Scattered over the surface of the island from the seashore to the summit of the hill, I observed large blocks of vesicular doleritic lava, rich in olivine. The summit of the hill is crowned with three remarkable blocks of this rock, about 200 yards distant from one another. I also observed blocks of limestone scattered over the surface of the ground from the seashore to the summit of the hill. This stone contains Diatomaceæ and other organisms. When struck with another stone, it gives out a metallic ring.

Our knowledge of the flora of Round Island is at present very unsatisfactory, because many of the plants found on the island have been either imperfectly identified or not identified at all, from the absence of flowers and fruit. Owing to the great difficulty of landing on the island, except after a spell of calm weather, it has happened that the flora has been investigated at the same season of the year by the different naturalists who have visited the island. Colonel Lloyd visited Round Island in December 1844, Colonel Pike in November 1868 and 1869, Sir H. Barkly and Mr. Horne in November 1869, and I in November 1889.

The following table shows the number of species in each of the three divisions of the vegetable kingdom; but it is probable that in some instances, owing to imperfect specimens, the same plant may have been referred to different species by the different botanists who have investigated the flora of Round Island. I have tried to obviate this source of error as far as possible. Further investigation and the examination of perfect specimens in flower and fruit, where these can be obtained, will clear up doubtful points, and it

is probable that additional species will be found if the island is visited at another season of the year.

CLASS.	Native.	Naturalised.	Total.
Dicotyledones . . .	24	1	25
Monocotyledones . . .	12	1	13
Cryptogamæ . . .	14	—	14
Total . . .	50	2	52

Of the 50 native species of plants, the Dicotyledons include 24 species, or almost half of the total number. There are 12 species of Monocotyledons, so that these are exactly in the proportion of one to two of the Dicotyledons, which is also the proportion of these two classes to each other in the flora of Mauritius. There are 14 species of Cryptogams, only 3 of which were observed by the other botanists prior to my visit in 1889. The 52 species belong to 28 natural orders, or less than 2 species to an order on an average. The number of species in the larger orders are Lichenes 6, Gramineæ 5, and Ebenaceæ, Euphorbiaceæ, and Palmæ 3 each.

Bojer, in his "Hortus Mauritianus," published in 1837, records 2 species of plants from Round Island, but Bojer never visited the island himself; Lloyd records 12 species by their vernacular names; Pike 11 species; Barkly and Horne 29 species; and myself 39 species. Of the 39 species observed and collected by me, 20, or fully half, were not observed by the other botanists. On the other hand, of the total 52 species recorded from Round Island, 13 were not observed by me; but, as I have already stated, some of these latter are probably identical with plants collected by me and recorded under different specific names.

The type of the flora is essentially Mauritian, but many of the plants found in Round Island depart considerably from the type of the same species in Mauritius. So far as the plants have been identified, most of the Round Island species are also native in Mauritius, but it is probable that several of the species which have not been identified may turn out to be new, and not occur in

Mauritius. The palm, *Latania Loddigesii*, Mart., is endemic in Round Island, Flat Island, and Coin de Mire, but not in Mauritius. The screw-pine, *Pandanus Vandermeerschii*, Balf. fil., is endemic in Round Island, Flat Island, Coin de Mire, Amber Island, and probably in Ile Vakois, but not in Mauritius. *Trichosandra borbonica*, Dcne., belonging to the Asclepiadaceæ, is found in Round Island, but not in any of the other islands of the Mauritius group. It is native, however, in Bourbon, 100 miles distant. Of the species that have been identified, two only are endemic in Round Island and found in no other part of the world, viz., the Bottle Palm, *Hyophorbe amaricaulis*, Mart., and *Selaginella Barklyi*, Baker; and even this small number, I think, must be reduced to one, for in a note on specimens of *S. obtusa*, Spring, forwarded by me from Round Island to Kew, Mr. Baker writes: "I am afraid *S. Barklyi* is only an extreme form of *obtusa*." I did not find *S. Barklyi* in Round Island; but all the plants of *S. obtusa* I observed in Round Island were much smaller and had smaller leaves than the plants of the same species observed by me in Mauritius. Baker, in his "Flora of Mauritius and the Seychelles," writes with reference to two species of *Diospyros* from Round Island, that both "may likely prove, when fully known, distinct from the Mauritian species." The leguminous plant and *Phyllanthus* found by me in Round Island, but not identified, do not agree with the description of any species described in Baker's "Flora of Mauritius and the Seychelles."

In a few places groups of palms and Pandani have retained the soil by means of their numerous adventitious roots; but in most places these trees and the other plants grow on the bare rocks, their roots descending through the vertical cracks and then spreading out to great distances between the stratified layers of volcanic tuff. In some of the plants I dug up, the roots exceeded the stems several times in length. In dry weather the plants suffer from drought, on account of the greater part of the rain-water flowing down the steep, rocky slopes into the sea immediately after falling on the island. On the lower slopes on the west side of the island I observed many shrubs of *Fernelia buxifolia*, Lam., dead from the effects

of the drought. The plants are very much exposed to the terrific hurricanes which occasionally devastate the Mauritius group of islands. It is not, therefore, to be wondered at that I nowhere saw any trees exceeding 20 feet in height, although Sir H. Barkly writes that he saw plants of *Latania Loddigesii*, Mart., 40–50 feet high in one of the sheltered ravines not visited by me. This palm and the *Pandanus Vandermeerschii*, Balf. fil., are the two most widely distributed trees on the island, extending from the seashore upwards to near the summit of the hill. The other two species of palms, the *Hyophorbe amaricaulis*, Mart., and *Dictyosperma album*, Wendl., were not so abundant on the lower slopes of the hill near the sea as the two former trees. The dicotyledonous trees and shrubs formed a small wood on the south side of the hill 450–550 feet above sea-level, and it was in this wood only where I found the *Trichosandra borbonica*, Dcne. Although fourteen species of Cryptogams are recorded, they were by no means abundant in number, and most of them would have been passed over by me unobserved if I had not kept a careful look-out for them.

The remainder of my paper contains a complete list of all the plants recorded from Round Island by myself and others. I have followed the nomenclature of Baker's "Flora of Mauritius and the Seychelles," so far as Round Island species are described in it. The lower Cryptogams were identified by Mr. C. H. Wright of Kew Herbarium, and doubtful plants were referred to Mr. J. G. Baker and Mr. N. E. Brown, of the same institution.

Under each species I have entered notes of my own, taken from living specimens; and I have also, as far as possible, entered in chronological order the different names under which the other botanists have recorded the plants observed by them.

ABBREVIATIONS.

- Bojer, Hort. Maur.—Hortus Mauritianus. By W. Bojer. 1837.
Trans. Nat. Hist. Soc. Maur.—Transactions of the Natural History Society of Mauritius. 1842–1845.
Trans. Roy. Soc. Maur.—Transactions of the Royal Society of Arts and Sciences of Mauritius. New Series. Volume IV. 1869.
Sub-Trop. Rambles—Sub-Tropical Rambles. By Nicholas Pike. 1873.
Baker, Flor. Maur. Seych.—Flora of Mauritius and the Seychelles. By J. G. Baker. 1877.

LINACEÆ.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158, records having seen in 1844 the "Bois de Ronde," *Erthroyxylon laurifolium*, Lam.—Baker, Flor. Maur. Seych., p. 35, in the belts of forest wood on the upper part of the island. This shrub, which is native in the Mauritius, has not been seen in Round Island by the other botanists who have since visited the island.

LEGUMINOSÆ.

Among the trees on the south-east side of the hill, at 460 feet above sea-level, I found a leguminous plant, which I have not identified, as it was neither in flower nor fruit. Root woody, about a foot long, little branched. Stem about a foot long, woody, unbranched. Leaves 1-2 inches long, equally bipinnate, without tendrils; pinnæ, 3-5-jugate; leaflets, 5-15-jugate, $\frac{1}{3}$ inch long, oblong, subacute, glabrous, green above, pale purplish-green beneath.

This plant was not observed by the other botanists who previously visited the island.

SAMYDACEÆ?

On the south side of the hill, 480-520 feet above sea-level, I found several small trees, which, perhaps, belong to the Samydaceæ; but I have not identified them, as they were not in flower, and only two unripe fruits were obtained by me.

Tree 10-12 feet high, much branched, with terete, glabrous, brown branches. Leaves alternate, $1\frac{1}{2}$ -3 inches long, round-ovate, obtuse, rounded at the base, glabrous, dark-shining green above, pale green beneath, coriaceous; petiole $\frac{1}{4}$ - $\frac{1}{2}$ inch long. Unripe fruit springing from the axil of a branch, $\frac{1}{3}$ inch broad, globose, beaked, glabrous, pale green.

This tree appears to be the same as the one seen in 1869 by Barkly and Horne, and recorded by them in Trans. Roy. Soc. Maur., 1869, pp. 120 and 137:—"No. 22. Sp.: A small tree about 12 feet high, somewhat resembles *Blackwellia*, but I cannot trace it to any of them."

* PASSIFLORACEÆ.

*PASSIFLORA SUBEROSA, Linn.—Baker, Flor. Maur. Seych., p. 105. This tropical American species is naturalised in Round Island, where I found it common all over the island, with its stems trailing on the ground, or climbing up other plants. It is also naturalised in Mauritius, where it is common in the forests.

This plant was not observed by the other botanists who previously visited Round Island.

COMBRETACEÆ.

TERMINALIA BENZOIN, Linn. fil.,—Baker, Flor. Maur. Seych., p. 111 (*vide* J. G. Baker). This tree is rare on the south side of the hill, 520 feet above sea-level. It was neither in flower nor fruit. The leaves do not agree with the description in Baker, Flor. Maur. Seych., p. 111. Tree 10 feet high, much branched, with contorted, terete, brown branches. Leaves 4–6 inches long, oval, sub-acute, narrowed at the base, obscurely crenate, glabrous, dark-shining green above, pale yellowish green beneath, sub-coriaceous; petiole $\frac{1}{4}$ inch long. *T. Benzoïn*, Lim. fil., is native in Mauritius.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, records having seen, in 1844, the “Benjoin,” or Bois Benzoin, which is the vernacular name of the tree in Mauritius.

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 137, record having only seen, in 1869, three trees without flower or fruit of “No. 15. *Terminalia* species,” which, they considered, differed from all the *Terminaliæ* hitherto known in Mauritius, Bourbon, and Rodriguez.

MYRTACEÆ?

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 137, record having seen, in 1869, “No. 16. *Jossinia* species, a small shrubby tree about 5–10 feet in height.”

This tree was not observed by the other botanists who have visited Round Island.

PORTULACÆ.

PORTULACA OLERACEA, Linn.,—Baker, Flor. Maur. Seych., p. 125. I only found one small plant on the rocky hill-side, 200 feet above sea-level, near the landing-place, on the west side of the island. This plant is also native in Mauritius.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158, records having seen in Round Island, in 1844, the "Pourpier," which is the vernacular name of *P. oleracea*, L., in Mauritius.

RUBIACÆ.

FERNELIA BUXIFOLIA, Lam.,—Baker, Flor. Maur. Seych., p. 142. This shrub is common, and grows from 4-6 feet in height. On the west side of the island many of the plants were dead from the effects of the severe drought. I found no plants in flower or fruit at the time of my visit in November 1889. This species is also native in Mauritius.

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 137, record having seen, in 1869, "*Fernelia buxifolia*" (p. 119), which is the same as their "No. 17. *Fernelia* species" (p. 137).

In Baker, Flor. Maur. Seych., p. 142, under *Fernelia buxifolia*, Lam., one of the stations mentioned is "Round Island, Sir H. Barkly!"

On the south side of the hill, 500 feet above sea-level, I saw considerable numbers of a tree which was neither in flower nor fruit, and in which most of the leaves were in shreds, apparently from the attacks of insects. Mr. J. G. Baker, to whom specimens were sent, wrote to me the following note:—"Looks like a *Plectronia*, but cannot be certain without flowers." Tree 9-20 feet high, much branched, with spreading branches. Trunk $4\frac{1}{2}$ inches to 3 feet in circumference, 2 feet from the ground, with brown longitudinally-wrinkled bark. Leaves opposite, $1\frac{1}{2}$ - $2\frac{1}{2}$ inches long, broadly oval, obtuse, slightly cordate at the base, entire, glabrous, dark-shining green above, pale green beneath, coriaceous; petiole $\frac{1}{8}$ inch long. This tree appears to be the same as—"No. 18. *Pyrostria* species near *P.*

polymorpha”—seen by Barkly and Horne in 1869, and recorded by them in Trans. Roy. Soc. Maur., 1869, pp. 119 and 137.

COMPOSITÆ.

AGERATUM CONYZOIDES, Linn.—Baker, Flor. Maur. Seych., p. 163. This annual, which is also native in Mauritius, is common in Round Island, but at the time of my visit in 1889 all the plants were dead from the effects of the severe drought.

Barkly and Horne saw this plant in Round Island in 1869, and they record “No. 26. *Ageratum* sp.” in Trans. Roy. Soc. Maur., 1869, pp. 119 and 138.

In Baker, Flor. Maur. Seych., p. 163, under *Ageratum conyzoides*, Linn., one of the stations mentioned is “Round Island, Sir H. Barkly!”

SONCHUS OLERACEUS, Linn. ex parte.—Baker, Flor. Maur. Seych., p. 180. Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 138, record “No. 27. *Sonchus* sp.: Rare,” which they saw in Round Island in 1869. Barkly states that this *Sonchus* is the same as the one which grows in Flat Island, viz. *S. oleraceus*, Linn. ex parte. It is also native in Mauritius and in several of the small coral islands of the Mauritius group.

This plant was not observed by the other botanists who have visited Round Island.

MYRSINACEÆ ?

Barkly and Horne, in 1869, saw two plants at about 800 feet above sea-level, which, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 136, they record under “No. 14. *Badula* species (?). A small tree 12 feet in height, with the habit of growth of some of the larger growing *Ardisias*. Comes very near *Badula ovalifolia*, V. Don V. II., p. 13.”

This tree was not observed by the other botanists who have visited Round Island.

EBENACEÆ.

DIOSPYROS species.—On the south side of the hill, 450–530 feet above sea-level, I found a species of *Dios-*

pyros which I have not identified, as it was neither in flower nor fruit. It is probably one of the three species collected by Barkly and Horne in 1869. Tree 6-10 feet high, much-branched with spreading branches. Trunk $1\frac{1}{2}$ to 2 feet in circumference 2 feet from the ground, with glabrous smooth brown bark. Leaves alternate, $2\frac{1}{2}$ -5 inches long, broadly ovate, obtuse, cordate at the base, entire, glabrous, dark-shining green above, pale green beneath, coriaceous; petiole $\frac{1}{2}$ inch long.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158, records having seen the "Ebony" in Round Island in 1844.

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 118 and 137, record, under Nos. 19, 20, and 21, three species of *Diospyros* resembling *D. pterocalyx*, *melanida*, and *chrysophyllos* respectively. Specimens of these were forwarded to Kew, and they are referred to in Baker, Flor. Maur. Seych., pp. 198 and 199. One is identified as *D. leucomelas*, Poir., which is also native in Mauritius, and the other two are doubtfully placed under *D. mauritiana*, A. DC., and *D. melanida*, Poir.

D. LEUCOMELAS, Poir.—Baker, Flor. Maur. Seych., p. 198. "Round Island, Sir H. Barkly!"

D. MAURITIANA, A. DC.—Baker, Flor. Maur. Seych., p. 198. "We have barren specimens of an allied plant gathered by Sir H. Barkly on Round Island, with slender zig-zag branches, very short petioles, and very glossy strongly veined leaves three to four times as broad as long, rounded at both ends. Both this and the other Round Island forms may likely prove, when fully known, distinct from the Mauritian species."

D. MELANIDA, Poir.—Baker, Flor. Maur. Seych., p. 199. "We have a plant from Round Island, gathered by Sir H. Barkly, with a fruit-calyx just like that described above ('Fruit-calyx nearly flat, above an inch broad, the lobes produced at the border into a broad reflexed crisped wing'), but with larger leaves more rounded at the base, and veining more like that of *D. tessellaria*."

BORAGINACEÆ.

TOURNEFORTIA ARGENTEA, Linn. fil.—Baker, Flor. Maur. Seych., p. 201. Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, states that in 1844 “the shore to windward is studded with Veloutiers.”

“Veloutier” is the vernacular name of *T. argentea*, Linn. fil., in Mauritius, where the plant is also native.

Pike, in Trans. Roy. Soc. Maur., 1869, p. 15, records having seen in Round Island in 1868 “Veloutiers (*Tournefortia argentea*, Linn.).”

This plant was not seen in Round Island by Barkly, Horne, and me, but it is likely to occur there.

CONVOLVULACEÆ.

IPOMCEA PES-CAPRÆ, Roth.—Baker, Flor. Maur. Seych., p. 211. This plant, which is also native in Mauritius, was seen by Pike in 1868, and recorded by him as “*Ipomœa maritima*” in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 145. He saw it growing at 800 feet above sea-level.

Barkly and Horne also saw this plant in 1869, and they record it under “No. 13. *Ipomœa maritima*” in Trans. Roy. Soc. Maur., 1869, pp. 118 and 136.

It was not observed by me in 1889.

DICHONDRA REPENS, Forst.—Baker, Flor. Maur. Seych., p. 213. This plant was growing on the ground between the aerial roots of *Pandanus Vandermeerschii*, Balf. fil., on the east side of the hill, 720 feet above sea-level. It was first found by Mr. W. Scott, who showed me the place where it was growing. It is also native in Mauritius. The plants were in fruit. Leaves $\frac{1}{4}$ – $\frac{1}{3}$ inch broad, green above, pale green beneath. Capsule brown; pedicel drooping. This plant was not observed by the other botanists who previously visited Round Island.

SOLANACEÆ.

SOLANUM NIGRUM, Linn.—Baker, Flor. Maur. Seych., p. 214. I found only one plant, 2 inches high, on the rocky ground 180 feet above sea-level, near the landing-place on

the west side of the island. This plant, which is also native in Mauritius, was not observed by the other botanists who previously visited Round Island.

ASCLEPIADACEÆ.

TRICHOSANDRA BORBONICA, Dcne.—De Candolle, Prodr. viii. 626 (*vide* N. E. Brown). This plant is not recorded from Mauritius in Baker, Flor. Maur. Seych., but it is recorded from Bourbon by Petit—Thouars and Lépervénche—Mezières, in De Candolle, Prodr. viii. 626, published in 1844. In Round Island the plant is common in the forest belt on the south side of the hill, 530–540 feet above sea-level. The following description was made from living specimens, by me, on 27th November 1889:—A woody climber with a stem 3 inches thick 2 feet from the ground, and long, slender, terete, glabrous, greyish-brown branches, twining right to left round other plants to a height of 10 feet; juice milky. Leaves opposite, petioled, 1–3 inches long, $\frac{1}{2}$ –2 inches broad, oblong or obovate-oblong, obtuse or sub-acute, mucronate, rounded or slightly cordate at the base, entire, glabrous, dark green above, pale green beneath, coriaceous, pinninerved. Calyx purplish green. Corolla-limb 5-lobed, pale whitish purple. Pollinia waxy. Stigma peltate, pale yellow, with a shallow, pale purplish-yellow pit on the top at the centre. Follicles one or two developed, divaricate, 2–3 inches long, fusiform, glabrous, dark green, becoming brown after dehiscence. Seeds $\frac{1}{2}$ inch long, obspatulate, flexuous, wrinkled, glabrous, brown, with the truncate apex crowned with a copious tuft of simple, spreading, white hairs 1 inch long.

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 118 and 136, record this plant from Round Island, in 1869, under “No. 2. *Streptocaulon* species.”

TYLOPHORA LÆVIGATA, Dcne.—Baker, Flor. Maur. Seych., p. 228. I found this plant, in flower and fruit, common all over the island, from the seashore to the top of the hill 1055 feet above sea-level. It is also native in Mauritius.

Barkly and Horne saw this plant in Round Island in

1869, and they record it under "No. 1. *Tylophora* species" in Trans. Roy. Soc. Maur., pp. 118 and 135.

In Baker, Flor. Maur. Seych., p. 228, one of the stations mentioned under *T. lævigata*, Dcne, is "Round Island, Sir H. Barkly!"

NYCTAGINACEÆ.

BOERHAAVIA DIFFUSA, Linn.—Baker, Flor. Maur. Seych., p. 264. I found this plant in flower and fruit sparingly on the rocky hillside, 200–240 feet above sea-level, near the landing-place on the west side of the island. It is also native in Mauritius. Stems $\frac{1}{3}$ –1 foot long. Leaves dark green above, pale whitish-green beneath. Corolla $\frac{1}{3}$ inch across when expanded, purple. Filaments dark purple; anthers pale yellow. In all the Round Island plants the corolla is purple and the filaments dark purple, whereas in all the plants I observed on the coral islands lying off the south coast of Mauritius, the corolla was green with white lobes, and the filaments were white. This plant was not observed by the other botanists who previously visited Round Island.

EUPHORBIACEÆ.

EUPHORBIA THYMIFOLIA, Burm.—Baker, Flor. Maur. Seych., p. 303. I found this plant, sparingly in flower and fruit, on the rocky hillside, 200 feet above sea-level, near the landing-place on the west side of the island. It is also native in Mauritius. Stems $\frac{1}{2}$ –2 $\frac{1}{2}$ inches long. This plant was not observed by the other botanists who previously visited Round Island.

PHYLLANTHUS NIRURI, Linn.—Baker, Flor. Maur. Seych., p. 309. I found only three plants, without flowers or fruit, on the rocky hillside, 200 feet above sea-level, near the landing-place on the west side of the island. This plant is also native in Mauritius. It was not observed by the other botanists who previously visited Round Island.

PHYLLANTHUS sp.—On the rocky hillside, 680 feet above sea-level, at the east side of the island, I found only two plants of a *Phyllanthus*, which I have not identified, as it

was neither in flower nor fruit. Stems $1\frac{1}{2}$ –3 inches long, erect. Leaves $\frac{1}{3}$ inch long, oblanceolate-linear, obtuse; stipules deltoid-acuminate. This plant was not observed by the other botanists who previously visited Round Island.

LILIACEÆ.

LOMATOPHYLLUM BORBONICUM, Willd.—Baker, Flor. Maur. Seych., p. 374. I found this plant, without flowers or fruit, common on the rocky ground, 1020 feet above sea-level, near the top of the hill, at the north end of the island. It is also native in Mauritius.

Barkly and Horne saw this plant in 1869, and they record it, in Trans. Roy. Soc. Maur., 1869, pp. 118 and 137, under "No. 23. *Aloe* sp."

Pike, in Sub-Trop. Rambles, p. 145, states that he saw "a species of *aloe*" in Round Island in 1869.

ASPARAGUS UMBELLULATUS, Sieber.—Baker, Flor. Maur. Seych., p. 377. I found only one plant in fruit, climbing on *Pandanus Vandermeerschii*, Balf. fil., on the rocky hillside, 160 feet above sea-level, near the landing-place on the west side of the island. This plant, which is also native in Mauritius, was not observed by the other botanists who previously visited Round Island.

PALMÆ.

LATANIA LODDIGESII, Mart.,—Baker, Flor. Maur. Seych., p. 381. I saw this palm common all over the island. The male plants were in flower, and the female in fruit. Palm 10–20 feet high. Leaves coriaceous, glaucous on both surfaces, with a dark purple margin; petioles tomentose and pale yellow at the base, glabrous and green in the upper part, split at the base and perforated by the spadices in the outer leaves. Male flowers odoriferous. Perianth-segments, filaments, and anthers yellow. Pollen ellipsoid, glabrous, yellow. Drupe dull green.

Bojer, who never visited Round Island, erroneously recorded this palm from Round Island under *Latania rubra*, Jacquin, in Bojer, Hortus Mauritianus, p. 307, which was published in 1837.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158, states that in 1844 he saw in Round Island the "Ravinal with its fan-like leaves," by which he evidently meant the *L. Loddigesii*, Mart., which is the only plant with fan-like leaves on the island. The Ravenal, *Ravenala madagascariensis*, Sonnerat, belongs to the natural order Musaceæ, and it is a native of Madagascar. It is naturalised in Mauritius, where it grows in wet ground near water, conditions which do not exist in the dry rocky hillsides of Round Island.

Pike saw this palm in Round Island in 1868, and he records it as "*Latania glaucophylla*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 145.

Barkly and Horne also saw it in 1869, and they record it as "*Latania glaucophylla*" in Trans. Roy. Soc. Maur., 1869, pp. 116, 117, and 138. Barkly states that he saw plants of this palm 40-50 feet high in the sheltered ravines in Round Island.

In Baker, Flor. Maur. Seych., p. 381, under *L. Loddigesii*, Mart., the following stations are mentioned:—"Mauritius, on Round Island, Flat Island, and Coin de Mire. Indigenous only on these islets, but introduced on the mainland, Horne! Endemic."

HYOPHORBE AMARICAULIS, Mart.—Baker, Flor. Maur. Seych., p. 283. This palm is common, and I found it in flower, but not in fruit. Palm 10-20 feet high, with the stem bottle-shaped at the base or, rarely, at the middle. Leaf-sheath thick, glabrous, pale green; midrib of leaf green; pinnae sub-coriaceous, shining green on both surfaces, with pale yellow veins and margin. Male perianth-segments pale yellow. Filaments whitish; anthers pale yellow; pollen ellipsoid, glabrous, yellow. Rudimentary ovary yellow, with a pale-green apex.

Bojer erroneously recorded this palm from Round Island under *Chamærops excelsior*, Boj., in Bojer, Hort. Maur., p. 307, which was published in 1837.

Lloyd saw this palm in Round Island in 1844, and records it as the "Cocoa-nut tree" in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158.

Pike also saw it in 1868, and he erroneously records it

as the "*Jubæa spectabilis*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 144.

Barkly and Horne saw it in 1869, and they record it under "No. 24. Bottle Palm" in Trans. Roy. Soc. Maur., 1869, pp. 114–116 and 138.

In Baker, Flor. Maur. Seych., p. 383, under *H. amari-carulis*, Mart., the only station mentioned is "common in Round Island, Barkly! Horne! Endemic."

The vernacular name of this palm in Mauritius is Palmiste Gargoulette or Bottle Palm.

DICTYOSPERMA ALBUM, Wendl.—Baker, Flor. Maur. Seych., p. 384. I saw this palm common in Round Island in fruit only. It is also native in Mauritius.

Palm 10–20 feet high. Leaf-sheath thin, tomentose, pale whitish-yellow; midrib of leaf green; pinnae coriaceous, shining green above, glaucous beneath, with green veins and margin. Spadix 1 foot long, with persistent membranous bracts at the bases of the branches. Fruit $\frac{1}{2}$ inch long, ovoid, glabrous, shining green, with a brown apex. Persistent perianth-segments pale green, with a brown margin and apex.

Lloyd saw this palm in Round Island in 1844, and he records it by its vernacular name "Palmiste" in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158.

Pike also saw it in 1868, and he records it as "*Areca alba*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 144.

Barkly and Horne saw it in 1869, and they record it under "No. 25 Areca sp.: Near *A. alba*," in Trans. Roy. Soc. Maur., 1869, pp. 116 and 138.

In Baker, Flor. Maur. Seych., p. 384, under *D. album*, Wendl., the following note occurs:—"In a plant from Round Island, Mr. Horne says one or two of the lower branches of the spadix are subtended by membranous bracts."

PANDANÆ.

PANDANUS VANDERMEERSCHII, Balf. fil.—Baker, Flor. Maur. Seych., p. 398. I saw this plant common all over the island in fruit only.

Tree 10–20 feet high. Leaves channelled above, keeled

beneath, glabrous, shining green above, glaucous beneath, rigidly coriaceous, with the midrib and margin pale green, and armed with reddish brown spines. Drupes pale yellow at the base, brownish-red at the middle, and pale reddish yellow at the apex.

Lloyd saw the "Vacoa," which is the vernacular name of *Pandanus* in Mauritius, in Round Island in 1844, and he records it by this name in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158.

Pike saw it in 1868, and he records the "*Pandanus Vandermeerschii*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 145.

Barkly and Horne also saw it in 1869, and they record "*Pandanus Vandermeerschii*" in Trans. Roy. Soc. Maur., 1869, pp. 113 and 114.

In Baker, Flor. Maur. Seych., p. 398, under *P. Vandermeerschii*, Balf. fil., the following stations are mentioned:—"Round Island, Amber Island, Flat Island, and Coin de Mire, not on the mainland, Barkly! Horne! Balfour! Endemic." On 5th September 1889 I found one plant, without flowers or fruit, of a *Pandanus*, in Ile Vakois, which is probably *P. Vandermeerschii*, Balf. fil.

In Baker, Flor. Maur. Seych., *P. Vandermeerschii* is misspelt *P. Vandermeeschii*.

* *PANDANUS UTILIS*, Bory.—Baker, Flor. Maur. Seych., p. 398.—Barkly and Horne found several plants of this species in 1869, but they only occurred in one spot, scarcely more than 100 feet above the landing-place, and they came to the conclusion that the seeds had probably been planted there by some early visitor.

Bojer, in Hort. Maur., p. 301, published in 1837, records *P. utilis* as native in Mauritius; but Balfour in Baker, Flor. Maur. Seych., records it as "a native of Madagascar, is commonly planted in Mauritius for the sake of its leaves."

This plant was not observed by the other botanists who have visited Round Island.

CYPERACEÆ.

FIMBRISTYLIS GLOMERATA, Nees.—Baker, Flor. Maur. Seych., p. 418. I found this plant rare on the rocky hill

side, 110 feet above sea-level, on the west side of the island. It was neither in flower nor fruit. It is also native in Mauritius. This is probably the same plant seen by Barkly and Horne in 1869, and recorded by them under "No. 6. *Cyperus* species: Perhaps *Cyperus maritimus*," in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136.

GRAMINEÆ.

ANDROPOGON SCHÖENANTHUS, Linn.—Baker, Flor. Maur. Seych., p. 446.

Lloyd saw this grass in 1844, and recorded it by its vernacular name, "Citronnelle," in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158.

Pike saw it in 1868, and recorded it as the "Citronelle" in Trans. Roy. Soc. Maur. 1869, p. 15.

Barkly and Horne found this grass the most common one in the island, growing in tufts among the trees at the summit of the hill; and they recorded it by its proper name, "*Andropogon Schoenanthus*," in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136.

CHLORIS MONOSTACHYA, Poir.—Baker, Flor. Maur. Seych., p. 453 (*vide* J. G. Baker). I found this grass in a withered condition in fruit, 180-520 feet above sea-level. It is also native in Mauritius.

It is not recorded by the other botanists who previously visited Round Island; but it is probable that it is one of the grasses observed by them.

On the west side of the island, 200-460 feet above sea-level, I found a few specimens of a young grass, without flowers or fruit, which I have not identified. Stems 1-3 inches long, erect, pilose; leaves $\frac{1}{2}$ -1 $\frac{3}{4}$ inches long, lanceolate-linear, acute, green above, glaucous beneath.

This grass was probably observed by the other botanists who previously visited Round Island.

I found a common grass growing in withered tufts, without flowers, but with stems from which the grain had dropped off, on the rocky hillside, 180-520 feet above sea-level. I have not identified it, but it most probably was one of the grasses observed by the other botanists who

previously visited the island. Stems densely tufted, $\frac{1}{2}$ -1 $\frac{1}{4}$ foot long, erect. Leaves $\frac{1}{2}$ -1 foot long, linear, acuminate, glabrous, firm.

In addition to *Andropogon Schœnanthus*, Linn., recorded by Lloyd, Pike, Barkly, and Horne, these naturalists found at least four other species of Gramineæ, which, however, have not been identified, with the exception probably of *Chloris monostachya*, Poir., found by me in 1889.

Lloyd saw the "Chiendent" in 1844, and he records this name in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158.

This is probably the same grass referred to by Pike as the "creeping *Cynadon*," which he saw in 1868, and recorded in Trans. Roy. Soc. Maur., 1869, p. 15; and also the same as Barkly and Horne's "No. 7. *Cynodon* species: Not common," seen by them in 1869, and recorded in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842-45, p. 158, records the "Gazon," *Zoysia pungens*, Willd., which is native in Mauritius, and which he states he saw in Round Island in 1844.

Pike, in Trans. Roy. Soc. Maur., 1869, p. 15, records the "common Turfing grass," which he saw in Round Island in 1868; but which grass he refers to by this name I do not know.

Barkly and Horne saw the following three grasses in 1869, and recorded them as follows, in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136:—

"No. 5. *Graminæ* species."

"No. 8. *Graminæ* species: Rare. Only one small plant, and it had been eaten by the goats."

"No. 9. *Graminæ* species: Not common. Perhaps *Panicum brevifolium* or *Panicum repens*, both are Mauritius species."

FILICES.

ADIANTUM CAUDATUM, Linn.,—Baker, Flor. Maur. Seych., p. 474. I found this fern sparingly in fructification, in the crevices of rocks, 200-460 feet above sea-level, on the west side of the island. It is also native in Mauritius.

Fronds 1–3 inches long, $\frac{1}{3}$ – $\frac{1}{2}$ inch broad, shortly stalked.

Pike saw this fern in 1868, and he records "*Adiantum caudatum*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 145, with a drawing of the fern on p. 151.

Barkly and Horne saw it in 1869, and they record "*Adiantum caudatum*" in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136.

In Baker, Flor. Maur. Seych., p. 474, under *A. caudatum*, Linn., one of the stations mentioned is "Round Island, Sir H. Barkly."

SELAGINELLACEÆ.

SELAGINELLA BARKLYI, Baker. — Baker, Flor. Maur. Seych., p. 522. Barkly and Horne found this plant in 1869, and they record it under "No. 11. *Selaginella* species: not common," in Trans. Roy. Soc. Maur., 1869, pp. 112 and 136.

In Baker, Flor. Maur. Seych., p. 522, under *S. Barklyi*, Baker, the following note occurs:—"Round Island, Sir H. Barkly! and what is probably a more robust form of the same species with larger leaves from Coin de Mire, Horne! Endemic." This plant has not been found by the other botanists who have visited Round Island, but Baker, in a note on specimens of *S. obtusa*, Spring, collected by me in Round Island in 1889, writes—"I am afraid *S. Barklyi* is only an extreme form of *obtusa*."

S. OBTUSA, Spring.—Baker, Flor. Maur. Seych., p. 523 (*vide* J. G. Baker). I found this plant, in fructification, growing in the clefts of rocks, 580 feet above sea-level, on the south side of the hill. It is also native in Mauritius, but the Round Island plants have smaller leaves than those I found in Mauritius. Stems 1–3 $\frac{1}{2}$ inches long. Larger leaves $\frac{1}{8}$ inch long, minutely ciliated at the upper margin and apex. In Mauritius the plants I examined had the larger leaves $\frac{1}{2}$ inch long. In the Round Island plants the leaves were considerably browned, apparently from the effects of the prolonged drought.

With the exception of one moss, none of the following

Cryptogams were observed by the other botanists who previously visited Round Island:—

MUSCI.

BARBULA sp. (*vide* C. H. Wright). Friable rocks, 220 feet above sea-level, on the west side of the island. Plant yellowish brown.

Barkly and Horne saw one moss in 1869, and they record, in Trans. Roy. Soc. Maur., 1869, pp. 112 and 136, "No. 12. Moss from trees: common on the higher parts of the island;" and Sir H. Barkly writes, "I presume it to be a *sphagnum*."

Pike, in Sub-Trop. Rambles, in a footnote to p. 166, writes, "I believe it is *Hypnum acicularis*, Linn."

I did not observe this moss in 1889.

HEPATICÆ.

LEJEUNIA sp. (*vide* C. H. Wright).—Growing on the stem of the "Bottle Palm," *Hyophorbe amaricaulis*, Mart., 630 feet above sea-level, on the south side of the hill. Plant pale green.

LICHENES.

RAMALINA CALICARIS, Fr. (*vide* C. H. Wright).—Growing on the dead branches of *Fernelia buxifolia*, Lam., 240 feet above sea-level, on the west side of the island. Common. Thallus and fructification pale yellow.

PARMELIA CONSPERSA, Ach. (*vide* C. H. Wright).—Rocks on hillside, 450 feet above sea-level. Common. Thallus pale yellow.

PHYSICIA PICTA, Nyl. (*vide* C. H. Wright).—Growing on the adventitious roots of *Latania Loddigesii*, Mart., 200 feet above sea-level, on the west side of the island. Thallus white.

LECANORA SUBFUSCA, Ach. (*vide* C. H. Wright).—Growing on the dead branches of *Fernelia buxifolia*, Lam., 200 feet above sea-level, on the west side of the island. Plant white.

LECANORA near PHLOGINA, Nyl. (*vide* C. H. Wright).—Growing on the dead branches of *Fernelia buxifolia*, Lam., 200 feet above sea-level, on the west side of the island. Plant brownish yellow.

PSOROMA (?) (*vide* C. H. Wright).—Rocks on hillside, 720 feet above sea-level. Thallus greenish grey.

FUNGI.

CAPNODIUM, sp. (*vide* C. H. Wright).—Growing on the stem of *Hyophorbe amaricaulis*, Mart., 630 feet above sea-level, on the south side of the hill. Plant black.

POLYPORUS SANGUINEUS, Fries. (*vide* J. G. Baker).—Growing on the dead branch of a tree, 460 feet above sea-level, on the south side of the hill. Plant red on both surfaces.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING JUNE 1894. By ROBERT LINDSAY, Curator.

The past month has been rather cold and wet for June. There was an absence of any really warm weather, still no frost occurred, and as regards vegetation the month was a moderately good one. The lowest night reading of the thermometer was 34°, which was registered on the 1st of the month, and the highest 52°, on the 27th. The lowest day temperature was 55°, on the 4th, and the highest 83°, on the 26th. The foliage of forest and ornamental deciduous trees is now complete. Variegated varieties of *Biota*, *Cupressus*, and *Taxus* have developed bright, well-coloured foliage. Late rhododendrons and hawthorn were full of flower during June. Hardy herbaceous plants generally have grown well, and flowered abundantly.

On the rock-garden 288 species and varieties came into flower during the month. Amongst the most interesting were the following:—*Anthyllis montana rubra*, *Achillea mongolica*, *A. leucophylla*, *Anthemis macedonica*, *Androsace*

foliosa, *Campanula abietina*, *C. Hendersoni*, *C. "G. F. Wilson,"* *Cacalia alpina*, *Choisya ternata*, *Cistus formosus*, *Crambe cordifolia*, *Craspedia Richei*, *Cyananthus lobatus*, *Cypripedium Calceolus*, *Dianthus alpinus*, *D. cæsius*, *D. glacialis*, *D. neglectus*, *D. superbus*, *D. hybridus*, *Hedysarum obscurum*, *Helonias asphodeloides*, *Myosotis lithospermifolia*, *Modiola geranioides*, *Nardostachys Jatamansi*, *Linum alpinum*, *Lathyrus Drummondii*, *Linaria organifolia*, *Papaver alpinum*, *P. pyrenaicum*, *Potentilla lanaginosa*, *Ramondia pyrenaica*, *Rodgersia podophylla*, *Rosa alpina*, *Saponaria Boissieri*, *Saxifraga valdensis*, *Tropæolum polyphyllum*, *Silene quadridentata*, *Veronica cataractæ*, *V. carnosula*, *V. cupressoides*, *V. monticola*, *V. lycopodioides*, etc.

Readings of exposed Thermometers at the Rock-Garden of the
Royal Botanic Garden, Edinburgh, during June 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	34°	55°	65°	16th	40°	63°	74°
2nd	39	52	59	17th	50	57	64
3rd	44	54	62	18th	38	55	65
4th	45	50	55	19th	41	57	70
5th	41	43	57	20th	48	60	71
6th	34	51	63	21st	41	63	72
7th	36	54	70	22nd	42	65	72
8th	41	57	65	23rd	49	63	69
9th	47	54	61	24th	44	56	62
10th	46	54	61	25th	46	50	71
11th	45	50	63	26th	50	68	83
12th	45	60	69	27th	52	67	74
13th	44	65	69	28th	48	52	69
14th	44	54	70	29th	50	58	73
15th	50	62	69	30th	49	60	74

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF JUNE 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Ther- mometers for preceding 24 hours.		Hygrometer.			Kind.	Amount.	Direc- tion.	
		Max.	Min.	Dry.	Wet.					
1	29-757	54-3	39-0	53-8	48-7	N.	Cum.	1	W.	0-000
2	29-660	59-7	44-7	51-4	49-6	N.	Cir.	7	S.	0-000
3	29-913	54-2	48-2	50-8	48-7	E.	Cum. St.	10	E.	0-010
4	29-872	54-8	48-1	50-9	49-7	E.	Cum. St.	10	E.	0-755
5	29-719	51-8	45-2	45-7	44-8	E.	Nim.	10	E.	0-375
6	29-829	52-1	38-2	51-5	50-0	N.	...	0	...	0-000
7	29-769	57-6	41-8	53-2	52-8	N.E.	Cum.	9	N.	0-005
8	29-818	63-0	45-2	56-8	53-9	N.E.	...	0	...	0-045
9	29-774	59-6	50-0	52-6	52-0	N.E.	Cum. St.	10	N.E.	0-010
10	29-659	54-6	50-1	54-6	53-0	E.	Nim.	10	E.	0-820
11	29-556	56-4	47-2	56-1	51-0	N.W.	Cir.	4	N.W.	0-170
12	29-795	59-0	48-8	58-0	52-9	N.	Cum.	5	N.	0-015
13	29-930	64-1	47-5	59-7	52-8	S.E.	...	0	...	0-000
14	30-010	62-7	47-1	53-8	49-8	W.	Cum. St.	10	W.	0-000
15	29-800	64-4	53-6	62-1	58-2	S.W.	Cum.	9	S.W.	0-025
16	30-014	64-3	44-2	57-2	50-4	W.	Cum.	5	W.	0-000
17	29-606	65-7	54-0	57-7	54-2	S.W.	Cum. St.	10	S.W.	0-030
18	29-624	58-4	43-2	52-1	49-8	W.	Cum.	7	W.	0-055
19	29-884	58-8	44-6	53-9	49-7	S.W.	Cum.	10	S.W.	0-060
20	29-797	61-0	52-6	61-2	54-9	W.	Cum. St.	10	S.W.	0-000
21	30-034	63-6	45-2	58-3	50-0	W.	Cir. Cum.	3	W.	0-000
22	29-869	66-0	47-2	62-2	56-8	S.W.	Cir. St.	5	S.W.	0-000
23	29-758	65-1	52-2	58-9	54-5	S.W.	Cir. St.	10	S.W.	0-160
24	29-705	60-8	47-9	54-9	49-1	W.	Cum.	3	W.	0-010
25	29-984	60-8	49-7	51-4	50-4	E.	Cum. St.	10	E.	0-010
26	30-195	65-5	51-0	65-5	61-1	N.	Cum.	3	N.E.	0-000
27	30-317	72-7	55-2	63-9	58-6	E.	Cum. St.	9	E.	0-000
28	30-314	65-2	50-9	54-2	53-1	E.	Cum. St.	10	E.	0-000
29	30-360	62-2	54-4	57-7	56-4	E.	Nim.	10	E.	0-000
30	30-385	67-1	51-0	55-6	54-2	N.	...	0	...	0-000

Barometer.—Highest Observed, on the 30th, = 30·385 inches. Lowest Observed, on the 11th, = 29·556 inches. Difference, or Monthly Range, = 0·829 inch. Mean = 29·890 inches.

S. R. Thermometers.—Highest Observed, on the 27th, = 72°·7. Lowest Observed, on the 6th, = 38°·2. Difference, or Monthly Range, = 34°·5. Mean of all the Highest = 60°·8. Mean of all the Lowest = 47°·9. Difference, or Mean Daily Range, = 12°·9. Mean Temperature of Month = 54°·3.

Hygrometer.—Mean of Dry Bulb = 55°·8. Mean of Wet Bulb = 52°·4.

Rainfall.—Number of Days on which Rain fell = 16. Amount of Fall = 2·555 inches. Greatest Fall in 24 hours, on the 10th, = 0·820 inch.

A. D. RICHARDSON,
Observer.

III. ON PLANTS IN THE PLANT HOUSES, WITH EXHIBITION OF SPECIMENS. BY R. L. HARROW.

The past month of June has been prolific in the number of species of flowering plants in the houses of the Royal Botanic Garden, about one hundred and fifty having flowered during that period. Tropical and temperate ferns have rapidly, and with remarkable vigour, perfected their numerous fronds, giving the houses devoted to them a healthy pleasing appearance. Many of the cacti and other succulent plants are now commencing another year's growth, the apex of the stems of such genera as *Cereus*, *Mammillaria*, and others of like habit, presenting a much brighter colour.

Palms and foliage plants in the tropical houses are now growing luxuriantly, while in those buildings devoted to the cultivation of the natives of more temperate regions a promise of equal growth is exhibited in the large number of expanding buds and leaves. Amongst the flowering plants most worthy of notice are the following:—

Solanum Wendlandii, Hook. f. This is one of the finest of the species in cultivation of this genus, and is a native of Costa Rica. It was introduced by Dr. Wendland, Director of Herrenhausen Royal Gardens, Hanover, after whom it was named by Sir J. Hooker. The plant is of a climbing habit, the stem branches and petioles of the leaves bearing small prickles. The foliage is variable both in size and form, the lower being generally pinnate or pinnatifid, while those at the apex are simple. The inflorescence is a large cyme which terminates the branches, the flowers being of a lilac blue and often more than two inches across; these open successively, and thus each inflorescence continues in flower over a very lengthened period.

Gerbera Jamesonii, Bolus. "This plant is said to have first been discovered by the collector Rehman in 1878, and subsequently by Mr. Jameson in the goldfield district of Barbetown." See "Botanical Magazine," t. 7087, where a figure of this fine composite may be seen. The foliage is large and pinnatifid; the flower stalk rises to a height of more than a foot; the inflorescence, although bright, is said to lose much colour under cultivation. The ray florets, under

natural conditions at the Cape, being described as of a much more intense colour.

Combretum purpureum, Vall. A native of Madagascar. This lovely stove climber, although often seen in cultivation, is seldom seen in good condition. The flowers are small, of a rich dark scarlet colour, the stamens standing out from the petals in a very prominent manner; the inflorescence is a branched panicle bearing numerous flowers. The leaves are opposite and oblong lanceolate in shape, being of a reddish-brown colour while in a young state, gradually assuming a dark green with age. This plant is now placed by the "Index Kewensis" under its original name of *C. coccineum*, Lamk.

Musa coccinea, Roxb. This old inhabitant of our gardens is a small growing species, coming from China and Cochin China, growing to a height of about four feet. The inflorescence is a very attractive one, the spathes being of a very bright scarlet tipped with a yellow band. The leaves are about a yard in length, and six to nine inches in breadth.

Myrtus Luma, Molina. This very free flowering species is a native of Chili, and in some parts of the country is said to be hardy. A fine plant is now flowering in the temperate house. The leaves are small ovate; the inflorescences are borne at the extremities of the branches in profusion; the flowers are white, the petals being slightly concave, and the large number of stamens give them a light appearance. The flowers are slightly fragrant. The synonyms of *Eugenia apiculata*, and *E. Luma* have been given this plant, and, under the latter name, a fine figure may be seen in the "Botanical Magazine," t. 5040.

Cypripedium Stonei, Hook. Introduced by Messrs. Low, from Borneo; this is a very fine species. The leaves are stout and leathery, about an inch in width and a foot in length. The scape, which rises from amongst these, generally carries about three flowers. The sepals are white, broad, and striped with purple lines. The petals are about five inches long, curved downwards, these also being covered with purple spots.

Others worthy of note are:—*Mitraria coccinea*, Cav.,—a plant of scandent habit with lovely scarlet flowers, a native

of Chili; *Rhynchosstylis retusa guttata*, Rchb., fil. (*Saccolabium guttatum*, Linn.),—coming from the East Indies, bearing fine racemes of flowers; *Spathyphyllum hybridum*, Hort.,—a pretty Aroid with a large pure white spathe, being a cross between *S. cannaefolium* and *S. Patini*; *Arctotis Leichtliniana*, Lynch,—a native of South Africa, belonging to the order Compositæ, with large highly-coloured ray florets; *Aristea capitata*, Ker.-Gawl.,—an iridaceous plant with pretty blue flowers, native of Cape of Good Hope; *Desfontainea spinosa*, Ruiz. and Pav.,—a shrub resembling the holly, native of Peru, bearing solitary terminal scarlet and yellow flowers—a member of the order Loganiaceæ; *Actinotus Helianthii*, Labill.,—a curious umbelliferous plant, resembling somewhat a composite in the form of its inflorescence, a native of Australia; *Crossandra undulæfolia*, Salisb.,—sometimes called *C. infundibuliformis*, introduced from East Indies in 1881, a pretty stove plant belonging to the order Acanthaceæ.

